Air Quality Monitoring

Gregoire Lake Area

Alberta Environment

May to December 2000 — Final Report

Summary

Alberta Environment conducts mobile air quality surveys each year as part of its air quality monitoring program. These monitoring surveys are unannounced and use the department's *Mobile Air Monitoring Laboratory* (MAML). MAML monitoring provides a "snapshot" in time and space of the air quality at the location monitored. Pollutants measured by the MAML include carbon monoxide, oxides of nitrogen, ozone, particulate matter, hydrocarbons, sulphur dioxide, hydrogen sulphide, total reduced sulphur and ammonia.

Alberta Environment conducted a mobile, ambient air quality monitoring survey in the Gregoire Lake Area, south of Fort McMurray. The study consisted of four week-long surveys, over four seasons, for one year. A total of 105 hours of data were collected over 20 sampling days at 14 locations in the Gregoire Lake area during the spring, summer, fall and winter of 2000. Each site was monitored for a minimum of one hour to allow comparison with applicable Alberta one-hour ambient air quality guidelines. Monitoring sites were selected to provide data near populated areas and near industrial sites. Three sites (Site #1, Site #12, Site #13) were selected to provide background ozone levels.

The objectives of this survey were to determine the air quality in the survey area, compare ambient air concentrations from this survey with data from the Wood Buffalo Environmental Association monitoring network, and to compare air pollutant levels with Alberta's ambient air quality guidelines. This report presents the data collected by the MAML during the spring (May 15 to 19, 2000), summer (June 26 to 30, 2000), fall (September 11 to 15, 2000), and winter (December 4 to 8, 2000).

Analysis of the data indicates that:

- The air quality in the study area is comparable to the air quality in other non-industrialized urban communities in Alberta. Median and Maximum one-hour concentrations for air quality parameters in Alberta are presented in Tables 17 and 18.
- Ambient air concentrations measured during this survey were comparable to data obtained from the Wood Buffalo Environmental Association monitoring network. Tables 6 and 8 present the median and maximum ambient air concentrations measured at the WBEA monitoring network during the time of the survey.
- No exceedances of applicable guidelines occurred. Ambient levels of all air quality parameters measured by the MAML were below Alberta's ambient air quality guidelines.

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Findings

(1) **Concentrations of the air pollutants measured in the Gregoire Lake Area survey were below Alberta's ambient air quality (AAAQ) guidelines**[1]. Alberta has one-hour air quality guidelines for carbon monoxide, nitrogen dioxide, ozone, sulphur dioxide, hydrogen sulphide and ammonia. Maximum one-hour concentrations for these pollutants were:

- 20% of the one-hour guideline for hydrogen sulphide
- <1% of the one-hour guideline for ammonia
- 4% of the one-hour guideline for carbon monoxide
- 5% of the one-hour guideline for nitrogen dioxide
- 72% of the one-hour guideline for ozone
- 6% of the one-hour guideline for sulphur dioxide

Table 1 summarizes the monitoring results and relates the results to applicable guidelines.

(2) **Ambient air concentrations measured during this survey were comparable to data obtained from the Wood Buffalo Environmental Association monitoring network.** Tables 6 and 8 present the median and maximum ambient air concentrations measured at the WBEA monitoring network during the time of the survey.

Table 1. Summary of Monitoring Results and Ambient Guidelines for the Gregoire Lake MAML Survey for 2000

Pollutant		Units	Range		Median	Alberta Ambient One Hour Guideline	# Guideline Exceedances
			Minimum	Maximum			
Ammonia (NH_3)		ppm	<0.001	0.007	<0.001	2.0	0
Carbon Monoxide (CO)		ppm	<0.1	0.5	0.1	13.0	0
Hydrocarbons	Methane (CH_4)	ppm	1.6	4.6	1.9	n/a	n/a
	Reactive Hydrocarbons (RHC)	ppm	<0.005	1.8	<0.005	n/a	n/a
	Total Hydrocarbons (THC)	ppm	<0.005	5.0	2.0	n/a	n/a
Hydrogen Sulphide (H_2S)		ppm	<0.0006	0.002	<0.0006	0.010	0
Oxides of Nitrogen	Nitric Oxide (NO)	ppm	<0.001	0.024	0.002	n/a	n/a
	Nitrogen Dioxide (NO_2)	ppm	<0.001	0.011	0.002	0.212	0
	Total Oxides of Nitrogen (NO_x)	ppm	<0.001	0.034	0.003	n/a	n/a
Ozone (O_3)		ppm	0.006	0.059	0.031	0.082	0
Particulate Matter	PM_{10}	$\mu g/m^3$	<1	915	7	n/a	n/a
	$PM_{2.5}$	$\mu g/m^3$	<1	60	1	n/a	n/a
	TSP	$\mu g/m^3$	<1	1764	12	n/a	n/a
Polycyclic Aromatic Hydrocarbons		ng/m^3	<3	16	<3	n/a	n/a
Sulphur Dioxide (SO_2)		ppm	<0.0006	0.011	<0.0006	0.172	0
Total Reduced Sulphur (TRS)		ppm	<0.0006	0.004	<0.0006	n/a	n/a

$\mu g/m^3$-micrograms per cubic metre of ppm-parts per million n/a-no one hour guideline ng/m^3-nanograms per cubic metre of air

1 Alberta Ambient Air Quality Guidelines. Alberta Environment. February 2000.

Alberta's Ambient Air Quality Guidelines

Alberta's ambient air quality guidelines are established under Section 14 of the Environmental Protection and Enhancement Act (EPEA). EPEA provides for the development of guidelines and ambient environmental quality objectives for all or part of Alberta.

The ambient air quality guidelines are used for:

- reporting on the state of the atmospheric environment in Alberta.
- reporting to Albertans on the quality of air through an air quality index (AQI).
- establishing approval conditions for regulated industrial facilities.
- evaluating proposals to construct facilities that will have air emissions.
- guiding special ambient air quality surveys.
- assessing compliance near major industrial air emission sources.

Alberta's ambient air quality guidelines for one-hour concentrations of parameters monitored by the MAML and the basis for the guideline are listed in Table 2.

Table 2. Alberta's Ambient Air Quality Guidelines for Parameters Monitored by the MAML

AIR QUALITY PARAMETER	ONE-HOUR GUIDELINE (PPM*)	BASIS FOR GUIDELINE
ammonia	2.0	odour perception
carbon monoxide	13.0	oxygen carrying capacity of blood
hydrogen sulphide	0.01	odour perception
nitrogen dioxide	0.212	odour perception
ozone	0.082	reduction of lung function and effects on tomatoes
sulphur dioxide	0.172	taste, odour perception and effects on bluegrass

*Parts per million by volume.

Monitoring using the Mobile Air Monitoring Laboratory

Alberta Environment monitored air quality using the *Mobile Air Monitoring Laboratory* (MAML) in the Gregoire Lake Area from May 15 to December 8, 2000. Fourteen locations were monitored. Each location was monitored for a minimum of one hour at a time to allow comparison with Alberta ambient air quality guidelines. The data was also compared with air pollutant levels from monitoring stations in the Wood Buffalo Environmental Association monitoring network. More information on the Wood Buffalo Environmental Association monitoring network (WBEA) can be found at (http://www.wbea.org)

Air quality in the Gregoire Lake area was monitored on the following dates:

- Spring (May 15 – 19, 2000)
- Summer (June 26 – 30, 2000)
- Fall (September 11 – 15, 2000)
- Winter (December 4 – 8, 2000)

A total of 105 hours of data were collected at 14 locations. The monitoring sites were selected based on consultation with staff from Alberta Environment and stakeholders in the area. Monitoring was conducted for a minimum of one hour at each location to allow comparison with Alberta's Ambient Air Quality Guidelines. Please refer to Figure 2 for a map of the monitoring locations and to Table 3 for a listing of the sites.

The Mobile Air Monitoring Laboratory

The MAML is a 27-foot (8.2 m) vehicle that has been specially designed and equipped to measure air quality. It houses a variety of instruments that continuously sample the air at specified time or distance intervals.

The MAML is also equipped with:

- a dual computer system custom-programmed to control the measurement of air samples from each analyzer.
- a Global Positioning System (GPS) that will identify the MAML's location as it travels.
- an exhaust purifying system that minimizes emissions from the vehicle.
- two on-board generators that are also equipped with exhaust scrubbers.

The parameters measured by the MAML are listed in Table 4.

Figure 1. Alberta Environment's *Mobile Air Monitoring Laboratory* (MAML)

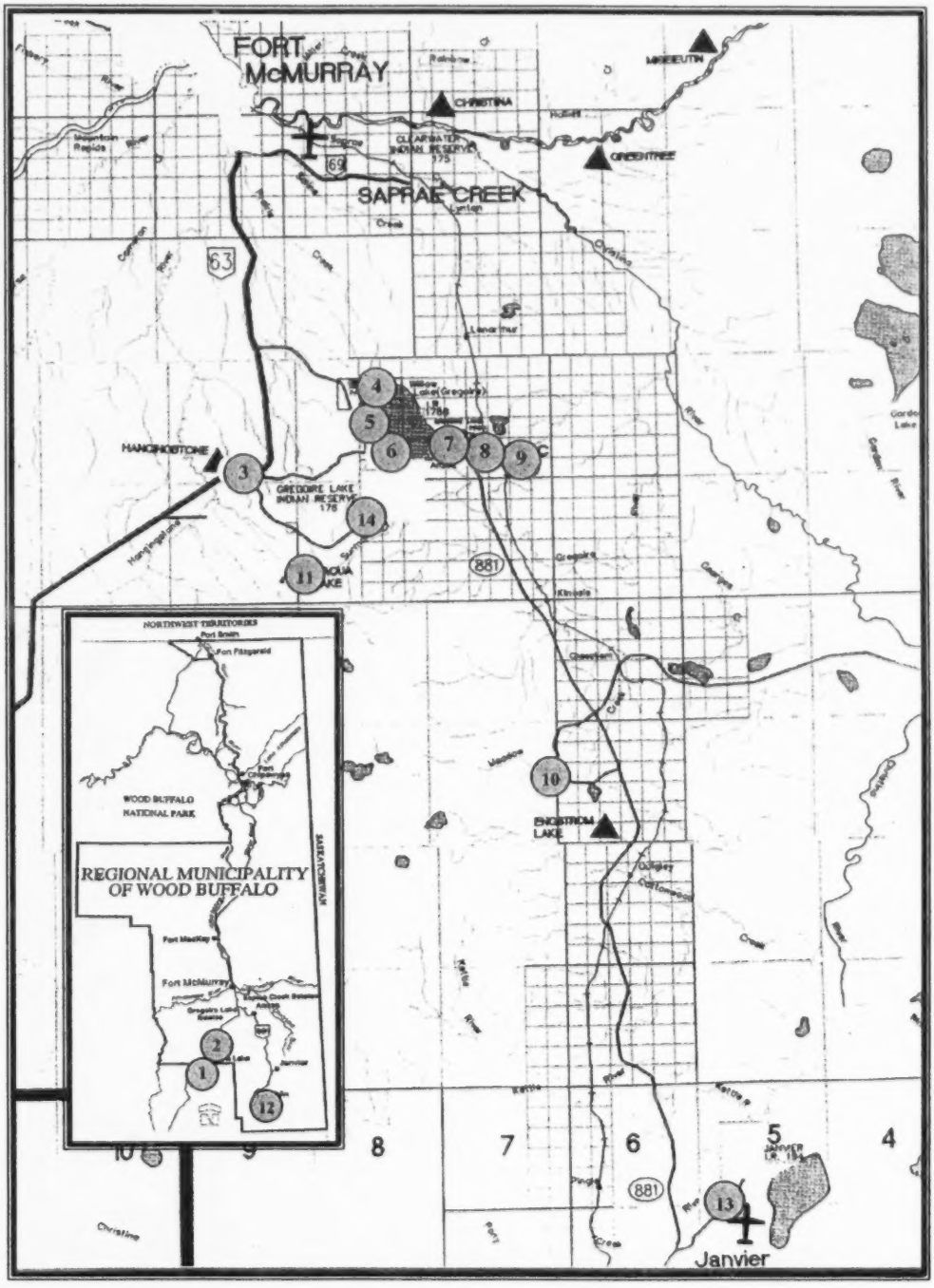


Figure 2. Monitoring Sites in the Gregoire Lake Area

Table 3. Monitoring Locations and Associated Site Numbers

Site #	Monitoring Location	Dates Monitored			
		May 2000	June 2000	Sept 2000	Dec 2000
1	Mariana Lakes gas station	15,19	26,30	11,15	4,8
2	Carrier Janvier Wood Products (SE 9 & SW 10 & NE 4 & NW 3-81-13-W4)	15,19	26,30	11,15	4,8
3	Hangingstone Provincial Park	15,19	26,30	11,15	8
4	Gregoire Lake Provincial Park (SW 27-86-8-W4)	16,19	27,29	12,14	5,7
5	Gregoire Lake Estates	16,18	27,29	12,14	5,7
6	Gregoire Water Treatment Plant	16,18	27,29	12,14	5,7
7	Cheecham campground	16,18	27,29	12,14	5,7
8	Anzac corner store	16,18	27,29	12,14	5,7
9	AMOCO Glisp site	16,18	-	-	-
10	Gulf Surmont (14-24-83-7-W4)	16,17	28	13	6
11	Maqua Lake	16,18	27,29	12,14	5,7
12	Conklin corner work camp	17	28	13	6
13	Janvier Water treatment plant	17	28	13	6
14	Amoco site (S 27-85-8-W4)	-	27,29	12,14	5,7

Table 4. Parameters monitored by the MAML in the Gregoire Lake Area survey (also includes minimum detection limits and operating ranges)

Parameter Measured	Minimum Detectable Limit*	Operating Range**
sulphur dioxide (SO_2)	0.6 ppb	1 ppm
hydrogen sulphide (H_2S)	0.6 ppb	1 ppm
total reduced sulphur (TRS)	0.6 ppb	1 ppm
total hydrocarbons (THC)	0.005 ppm	20 ppm
reactive hydrocarbons (RHC)	0.005 ppm	20 ppm
methane (CH_4)	0.005 ppm	10 ppm
polycyclic aromatic hydrocarbons (PAHs)	3 ng/m^3	1000 ng/m^3
ozone (O_3)	0.001 ppm	0.5 ppm
nitrogen dioxide (NO_2)	1.0 ppb	1 ppm
nitric oxide (NO)	1.0 ppb	1 ppm
total oxides of nitrogen (NO_x)	1.0 ppb	1 ppm
total suspended particulates (TSP)	1 $\mu g/m^3$	1.0 g/m^3
inhalable particulates (PM_{10})	1 $\mu g/m^3$	1.0 g/m^3
respirable particulates ($PM_{2.5}$)	1 $\mu g/m^3$	1.0 g/m^3
carbon monoxide (CO)	0.1 ppm	50 ppm
ammonia (NH_3)	1.0 ppb	5 ppm
wind direction (WDR)	0 degrees	360 degrees
wind speed (WSP)	0 kph	200 kph
temperature (Temp)	-40 °C	50 °C
relative humidity (RH)	0 %	100 %

ppb = parts per billion
ppm = parts per million
ng/m^3 = nanograms per cubic metre
$\mu g/m^3$ = micrograms per cubic metre
g/m^3 = grams per cubic metre
kph = kilometres per hour
°C = degrees Celsius
% = per cent

* The ***minimum detectable limit*** indicates the *minimum* amount of pollutant the instrument can measure.

** The ***operating range*** indicates the *maximum* amount of pollutant the instrument can detect. This limit is set to provide the optimum precision over that range. The upper limit can be raised, however, precision at the lower levels (where most levels are monitored) is then compromised.

Ammonia (NH_3)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
0.007 ppm	2.0 ppm

Ammonia is a colourless gas with the well-known pungent odour found in household cleaners. NH_3 is produced both by natural and anthropogenic sources. Some natural sources of NH_3 include the decay of plant material and animal waste. A small portion is also released during respiration. In Alberta, the fertilizer industry is the main industrial source of NH_3. Another major source of NH_3 are commercial feedlots, which result from the large amounts of animal waste present.

One-hour average concentrations of ammonia (NH_3) in the survey area ranged from less than 0.001 ppm to a maximum of 0.007 ppm. The maximum NH_3 concentration of 0.007 ppm is less than 1% of the one-hour guideline. The median one-hour average level of NH_3 for the survey was 0.001 ppm. Levels of NH_3 did not exceed the one-hour guideline at any of the monitoring sites. Please refer to Tables 5 and 7 for the data set.

The maximum one-hour average NH_3 concentration of 0.007 ppm was measured at Site #4 on June 29, 2000. Maximum one-hour NH_3 concentrations from other MAML surveys ranged from 0.020 ppm in the City of Lethbridge (1998/1999) to 1.364 ppm during the 1998/1999 survey conducted north of Lethbridge. Please refer to Table 12 for the data set.

The median NH_3 concentration was very low with a value of 0.001 ppm, which is the minimum detectable limit. Therefore 50% of the data for NH_3 was below the minimum detectable limit. Median NH_3 concentrations from other MAML surveys conducted in Alberta ranged from 0.001 to 0.075 ppm. Please refer to Table 11 for the data set. The WBEA stations do not continuously monitor NH_3.

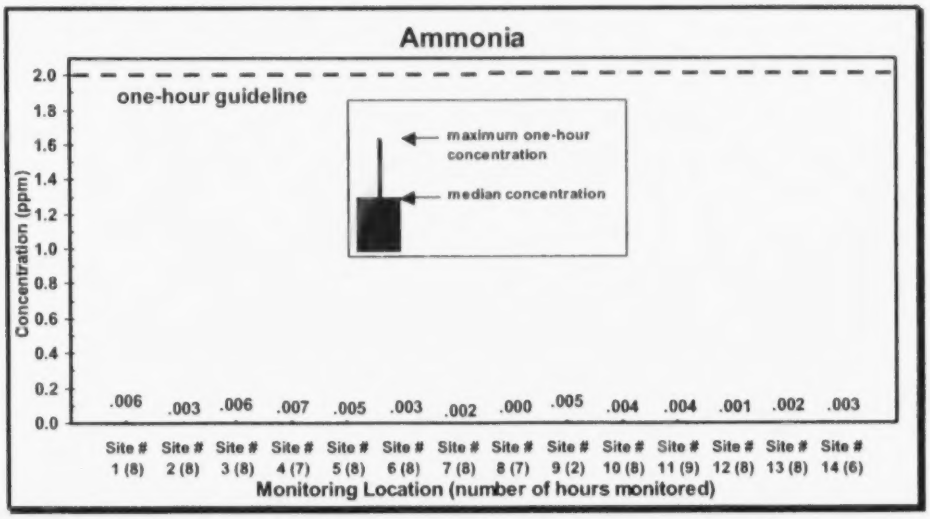

Ammonia
one-hour guideline
maximum one-hour concentration
median concentration
Concentration (ppm)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
.006 .003 .006 .007 .005 .003 .002 .000 .005 .004 .004 .001 .002 .003
Site # 1 (8) Site # 2 (8) Site # 3 (8) Site # 4 (7) Site # 5 (8) Site # 6 (8) Site # 7 (8) Site # 8 (7) Site # 9 (2) Site # 10 (8) Site # 11 (9) Site # 12 (8) Site # 13 (8) Site # 14 (6)
Monitoring Location (number of hours monitored)

Figure 3. One-hour median and maximum concentrations for ammonia

Carbon Monoxide (CO)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
0.5 ppm	13.0 ppm

Carbon monoxide (CO) is a colourless, odourless gas emitted into the atmosphere primarily by motor vehicles. Minor sources include fireplaces, industry, aircraft and natural gas combustion. The major source of carbon monoxide at urban locations is vehicle exhaust emissions.

None of the CO concentrations measured in this survey exceeded the one-hour Alberta ambient air quality guideline of 13.0 ppm. One-hour concentrations of carbon monoxide (CO) ranged from less than 0.1 ppm to a maximum of 0.5 ppm, which represents 4% of the one-hour Alberta ambient air quality guideline for CO. The median concentration during the survey was 0.1 ppm (See Tables 5 and 7).

The maximum one-hour CO concentration of 0.5 ppm was recorded at Site #6 on December 5, 2000. Maximum one-hour CO concentrations from other MAML surveys ranged from 0.7 ppm (Whitecourt/Swan Hills/Shiningbank Lake, 2000/2001) to 2.8 ppm in the City of Medicine Hat survey (1998/1999) (Table 17). Maximum CO levels at the permanent Edmonton and Calgary monitoring stations ranged from 2.8 to 11.2 ppm in 2001(Table 18).

The median CO concentration in the Gregoire Lake area survey was 0.1 ppm, which is the minimum detectable limit. Therefore 50% of the data for CO was below the minimum detectable limit. Median CO concentrations at other mobile surveys in Alberta range from 0.2 to 0.4 ppm. At urban locations such as Edmonton and Calgary, typical median CO levels range from 0.3 to 0.5 ppm, based on 2001 data collected from permanent continuous monitoring stations (Table 17). In the WBEA network, the Athabasca Valley station monitors for carbon monoxide. It reported an overall median one-hour CO concentration of 0.2 ppm and a maximum one-hour CO concentration of 0.6 ppm (Tables 6 and 8).

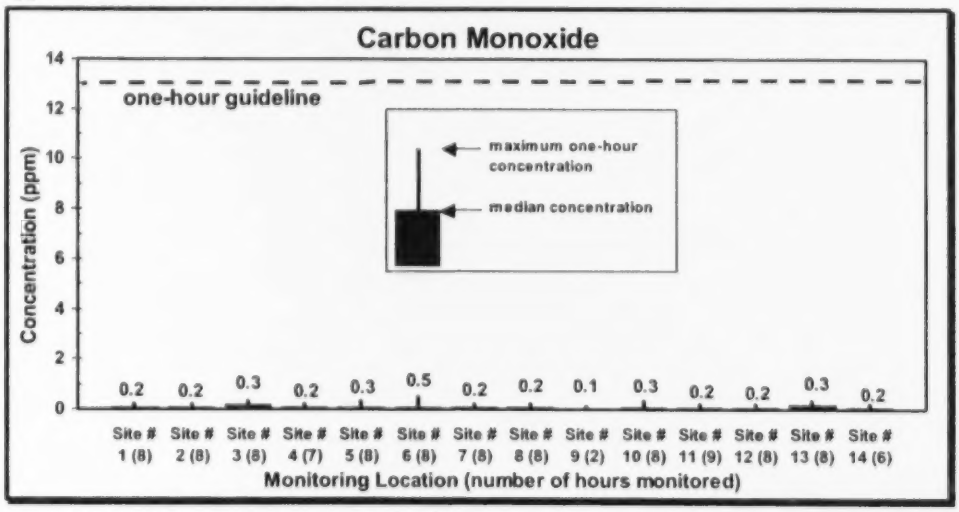


Figure 4. One-hour median and maximum concentrations for carbon monoxide

Hydrocarbons (THC, RHC and CH_4)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
THC 5.0 ppm	no guideline
RHC 1.8 ppm	no guideline
CH_4 4.6 ppm	no guideline

Total hydrocarbons (THC) refers to a broad family of chemicals that contain carbon and hydrogen atoms. Methane (CH_4), a non-reactive hydrocarbon, is the most common hydrocarbon in the earth's atmosphere. Specific reactive hydrocarbons (RHC) are important because they can react with oxides of nitrogen in the presence of sunlight to form ozone, and at high concentrations can be toxic to humans, animals, and vegetation. Sources of hydrocarbons include vegetation, vehicle emissions, gasoline stations and gasoline storage tanks, petroleum and chemical industries, dry cleaning, fireplaces, natural gas combustion, and aircraft traffic. Hydrocarbons are also emitted by fugitive sources such as evaporation of solvents, or leaking valves, flanges, pumps and compressors at industrial facilities. Incinerator and flare stacks can also be sources of hydrocarbons. Many hydrocarbons, such as CH_4, are emitted by natural sources. Background THC concentrations recorded in rural Alberta range from 1.5 to 2.0 ppm. Background hydrocarbons are primarily composed of CH_4 with a small contribution from RHC (about 0.2 ppm).

One-hour concentrations of total hydrocarbons (THC) ranged from less than 0.005 ppm to a maximum of 5.0 ppm. The median THC concentration was 2.0 ppm. One-hour concentrations of RHC ranged from less than 0.005 ppm to a maximum of 1.8 ppm. The median RHC concentration was 0.005 ppm. One-hour concentrations of CH_4 ranged from 1.6 ppm to a maximum of 4.6 ppm. The median CH_4 concentration was 1.9 ppm. Alberta does not have a one-hour guideline for hydrocarbons. Please refer to Tables 5 and 7 for the data set.

Maximum hydrocarbon concentrations were measured at Site #10 on June 28, 2000. The MAML was 200 metres from the nearest steam generator exhaust stack when these readings were detected (Figure 16). The maximum THC concentrations recorded at the WBEA stations ranged from 2.5 ppm at the Athabasca Valley and Patricia McInnes stations to 3.0 ppm at the Fort McKay station (Table 8).

Maximum THC levels from other MAML surveys ranged from 2.2 ppm in the Lethbridge area (1998/1999) to 32.4 ppm in the Grande Prairie area (1998/1999). Maximum one-hour THC levels ranged from 3.5 to 25.0 ppm at permanent monitoring stations in Alberta in 2001. Please refer to Table 18 for the data set.

The median THC level in the Gregoire Lake survey was 2.0 ppm. The overall median concentration of THC at the WBEA stations was between 1.8 and 1.9 ppm (Table 6). Median THC levels at permanent continuous monitoring stations in Alberta ranged from 1.8 to 2.2 ppm(Table 17).

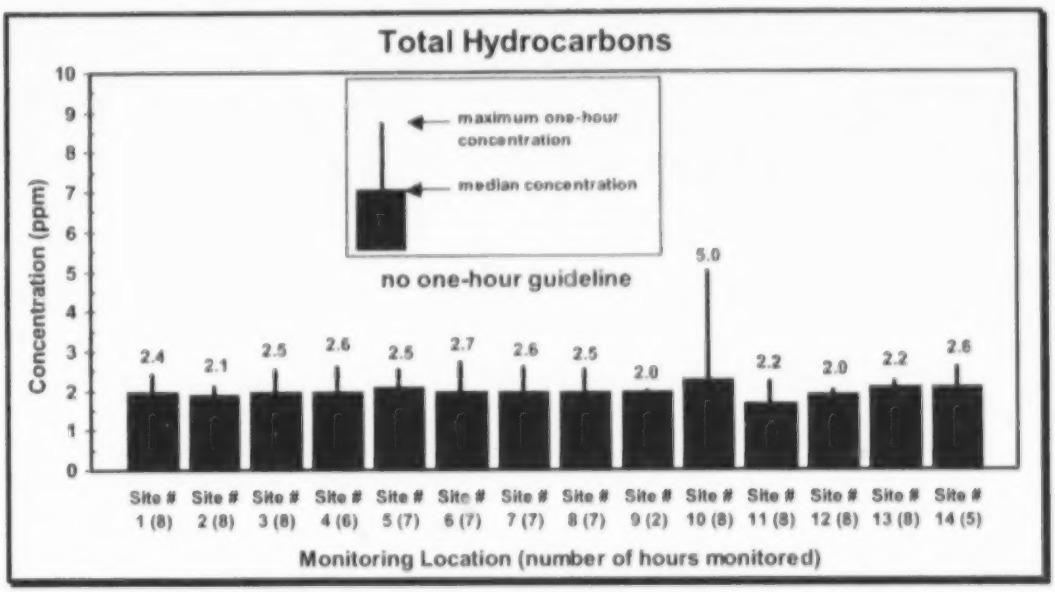


Figure 5 One-hour median and maximum concentrations for total hydrocarbons.

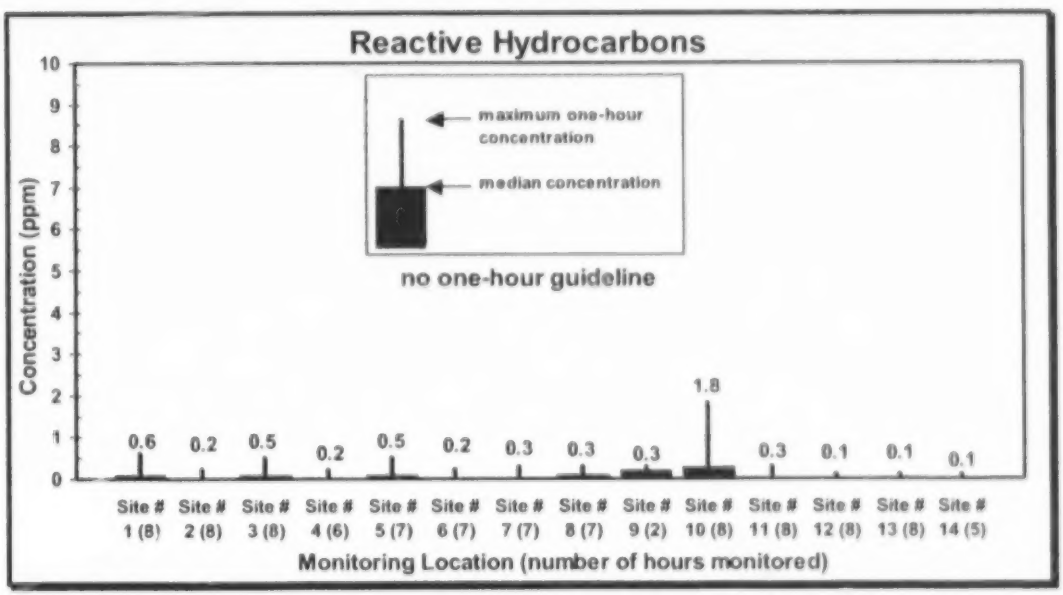


Figure 6 One-hour median and maximum concentrations for reactive hydrocarbons.

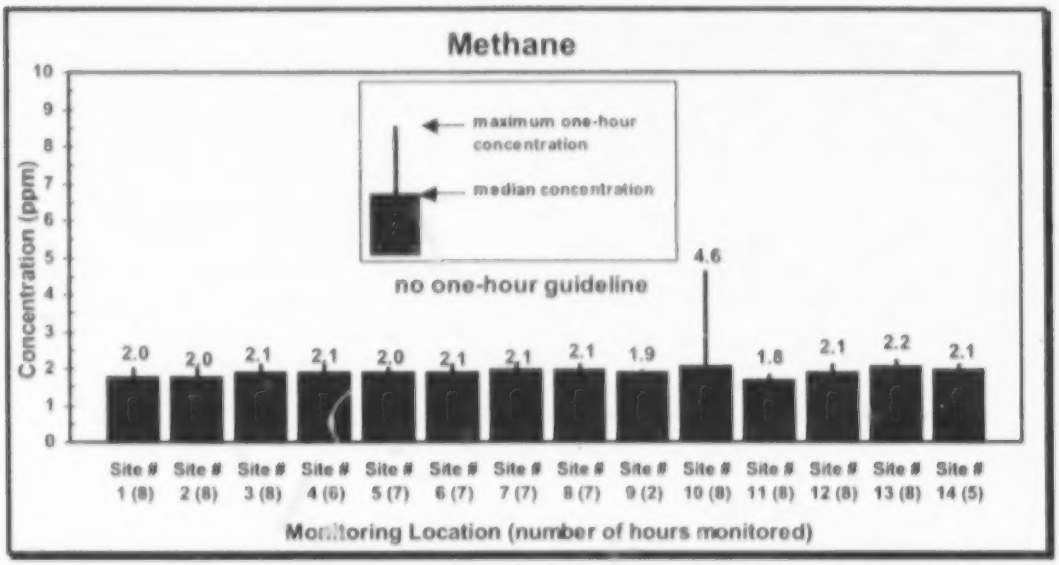


Figure 7. One-hour median and maximum concentrations for methane

Hydrogen Sulphide and Total Reduced Sulphur (H_2S and TRS)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
H_2S = 0.002 ppm TRS = 0.004 ppm	0.010 ppm no guideline

Hydrogen sulphide (H_2S) is a colourless gas with a rotten egg odour. Total reduced sulphur (TRS) includes hydrogen sulphide, mercaptans, dimethyl sulphide, dimethyl disulphide and other sulphur compounds. Sulphur dioxide is not included in the determination of TRS. Industrial sources of H_2S and TRS include fugitive emissions (leakages) from petroleum refineries, tank farms for unrefined petroleum products, natural gas plants, petrochemical plants, oil sands plants, sewage treatment facilities, pulp and paper plants that use the Kraft pulping process, and animal feedlots. Natural sources of H_2S include sulphur hot springs, sloughs, swamps and lakes.

None of the H_2S concentrations measured in this survey exceeded the one-hour Alberta ambient air quality guideline of 0.010 ppm. One-hour concentrations of H_2S ranged from less than 0.0006 ppm to a maximum of 0.002 ppm, which represents 20% of the one-hour guideline. The median concentration was 0.0006 ppm. Please refer to Table 17 for the data set.

The maximum one-hour H_2S concentration of 0.002 ppm was measured at Site #10 and #12 on May 17, 2000 (Table 7). Maximum one-hour concentrations of H_2S measured at the WBEA stations ranged from 0.002 ppm at the Mildred Lake station to 0.007 ppm at the Lower Camp station (Tables 6 and 8). Maximum one-hour H_2S concentrations measured during other MAML surveys in Alberta ranged from 0.002 ppm during the Bow Corridor survey (1999/2000) to 0.054 ppm in the Lethbridge area survey (1998/1999). Based on 2001 data, maximum one-hour H_2S levels at the AENV monitoring stations ranged from 0.005 ppm

(Fort Saskatchewan) to 0.038 ppm (Calgary East (Table 18). The median concentration of H_2S monitored during the survey was 0.0006 ppm, which is the minimum detectable limit. Therefore 50% of the data for H_2S was below the minimum detectable limit. Median one-hour H_2S concentrations measured during other MAML surveys in Alberta ranged from less than 0.0006 ppm to 0.001 ppm in the Lethbridge area (Picture Butte, Sterling). See Table 17 for the data set.

One-hour concentrations of TRS ranged from less than 0.0006 ppm to a maximum of 0.004 ppm. The median one-hour concentration of TRS for the survey was less than 0.0006 ppm. There is no one-hour guideline for TRS in Alberta.

The maximum one-hour TRS concentration of 0.004 ppm was recorded at Sites #1 and #3 on December 4 and 8, respectively and at Sites #10 and #13 on May 17 (Table 7). The maximum concentration of TRS measured at the three WBEA stations that record TRS ranged from 0.002 ppm to 0.001 ppm (See Table 8).

The overall median concentration of TRS from all sites monitored was less than 0.0006 ppm. Median concentrations of TRS at the monitoring stations in the WBEA were also less than 0.0006 ppm. (See Table 6).

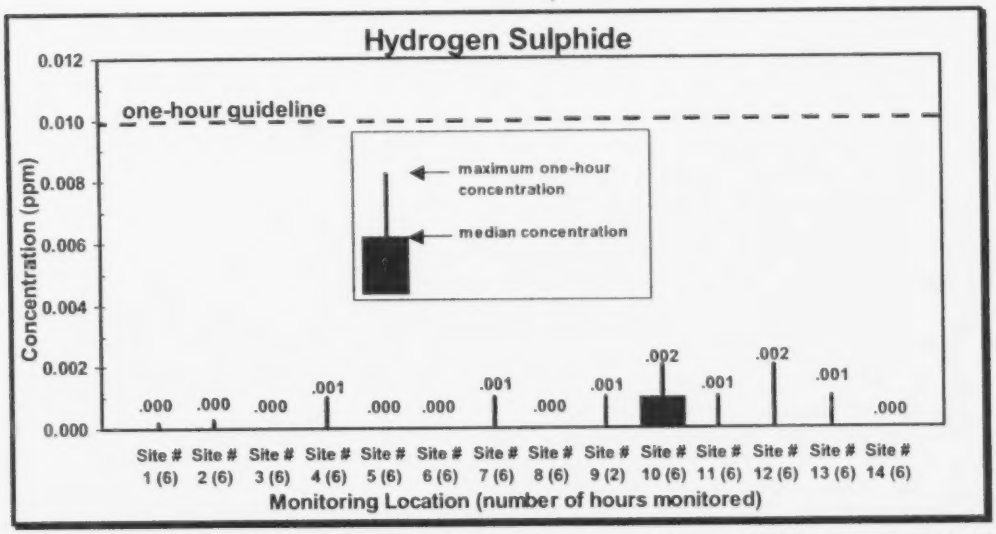

Hydrogen Sulphide
0.012
0.010
0.008
0.006
0.004
0.002
0.000
one-hour guideline
maximum one-hour concentration
median concentration
Concentration (ppm)
.000 .000 .000 .001 .000 .000 .001 .000 .001 .002 .001 .002 .001 .000
Site # 1 (6) Site # 2 (6) Site # 3 (6) Site # 4 (6) Site # 5 (6) Site # 6 (6) Site # 7 (6) Site # 8 (6) Site # 9 (2) Site # 10 (6) Site # 11 (6) Site # 12 (6) Site # 13 (6) Site # 14 (6)
Monitoring Location (number of hours monitored)

Figure 8. One-hour median and maximum concentrations for hydrogen sulphide

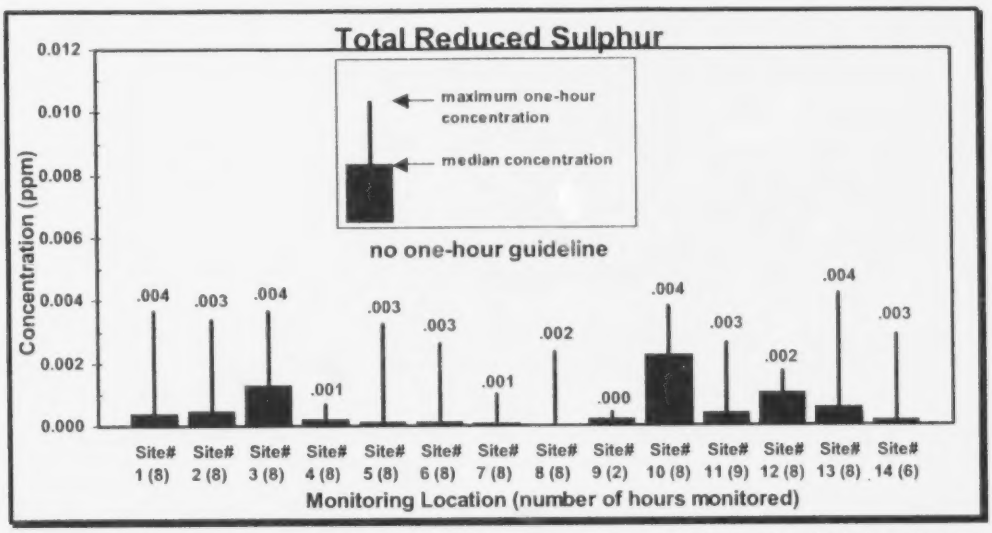
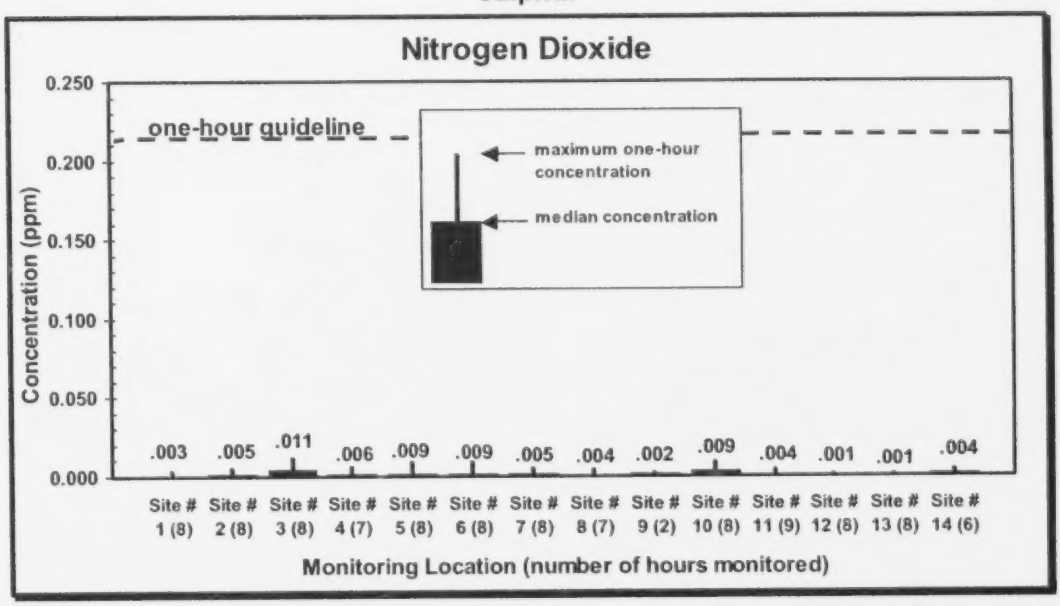

Total Reduced Sulphur
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Concentration (ppm)
maximum one-hour concentration
median concentration
no one-hour guideline
.004 .003 .004 .001 .003 .003 .001 .002 .000 .004 .003 .002 .004 .003
Site# 1 (8) Site# 2 (8) Site# 3 (8) Site# 4 (8) Site# 5 (8) Site# 6 (8) Site# 7 (8) Site# 8 (8) Site# 9 (2) Site# 10 (8) Site# 11 (9) Site# 12 (8) Site# 13 (8) Site# 14 (6)
Monitoring Location (number of hours monitored)

Figure 9. One-hour median and maximum concentrations for total reduced sulphur


Nitrogen Dioxide
0.250
0.200
0.150
0.100
0.050
0.000
Concentration (ppm)
one-hour guideline
maximum one-hour concentration
median concentration
.003 .005 .011 .006 .009 .009 .005 .004 .002 .009 .004 .001 .001 .004
Site # 1 (8) Site # 2 (8) Site # 3 (8) Site # 4 (7) Site # 5 (8) Site # 6 (8) Site # 7 (8) Site # 8 (7) Site # 9 (2) Site # 10 (8) Site # 11 (9) Site # 12 (8) Site # 13 (8) Site # 14 (6)
Monitoring Location (number of hours monitored)

. Figure 10. One-hour median and maximum concentrations for nitrogen dioxide

Oxides of Nitrogen (NO_2, NO and NO_x)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
NO_2 = 0.011 ppm	0.212 ppm
NO = 0.024 ppm	no guideline
NO_x = 0.034 ppm	no guideline

Oxides of nitrogen (NO_x) are the total of nitrogen dioxide (NO_2) and nitric oxide (NO). During high temperature combustion - as in the burning of natural gas, coal, oil and gasoline - atmospheric nitrogen may combine with molecular oxygen to form NO. NO is colourless and odourless. Most NO in the ambient air is oxidized to form NO_2. NO_2 is a reddish-brown gas with a pungent odour. The major source of oxides of nitrogen in urban areas is vehicle exhaust emissions. Processes associated with the oil and gas industry also emit oxides of nitrogen into the atmosphere.

None of the NO_2 concentrations measured in this survey exceeded the one-hour Alberta ambient air quality guideline of 0.212 ppm. One-hour concentrations ranged from less than 0.001 ppm to 0.024 ppm for NO, less than 0.001 ppm to 0.034 ppm for NO_x, and less than 0.001 ppm to 0.011 ppm for NO_2. The maximum NO_2 concentration measured represents 5% of the the one-hour guideline. The median concentration was 0.002 ppm for NO, 0.002 ppm for NO_2 and 0.003 for NO_x (Tables 5 and 7).

The maximum NO_2 concentration of 0.011 ppm was recorded at Site #3 on September 11. Maximum one-hour NO_2 concentrations typically range from 0.013 to 0.080 ppm at rural locations and from 0.065 to 0.150 ppm at urban locations in Alberta, based on 2001 data collected at permanent continuous monitoring stations (See Table 12).
At the WBEA stations, the maximum one-hour concentration of NO_2 was 0.029 ppm (Table 8).

The median NO_2 concentration at the Gregoire Lake survey was 0.002 ppm. Median NO_2 levels collected at permanent continuous monitoring stations in rural locations in Alberta in 2001 ranged from less than 0.001 to 0.004 ppm. Based on 2001 data, typical NO_2 levels range from 0.013 to 0.025 ppm in Edmonton and Calgary(Table 17). At the WBEA stations, the overall median concentrations of NO_2 were between less than 0.001 ppm and 0.004 ppm (Table 6). The primary source of oxides of nitrogen in the Gregoire Lake Area survey were vehicle exhaust emissions and emissions from processes related to the oil and gas industry.

Ozone (O_3)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
0.059 ppm	0.082 ppm

Ozone in the lower atmosphere is produced by the reaction of oxides of nitrogen and volatile organic compounds (VOC's) in the presence of sunlight. Transport of naturally occurring O_3 from the upper atmosphere to ground level contributes to ground level O_3 concentrations. Transport from the upper atmosphere is likely the dominant ozone producing process in the fall, winter and early spring seasons in Alberta. O_3 concentrations are generally lower in urban centres due to the destruction of O_3 by nitric oxide (NO), which results from combustion processes.

None of the O_3 concentrations measured in this survey exceed the one-hour Alberta ambient air quality (AAAQ) guideline of 0.082 ppm. The maximum one-hour concentration of ozone was 0.059 ppm, which represents 72% of the one-hour guideline for O_3. The median O_3 concentration for the survey was 0.031 ppm.

The typical daily and seasonal variations of O_3 concentrations that are observed at other locations in Alberta were also noted in the Gregoire Lake Area survey. The highest O_3 concentrations are generally measured in the afternoon during the spring and summer. Sites #1, #12 and #13 were selected to provide background ozone levels.

The maximum one-hour average O_3 concentration of 0.059 ppm was recorded on May 19,2000 at Site #1 (Table 7). Based on 2001 data, typical maximum ozone levels at permanent continuous monitoring stations in Alberta ranged from 0.055 ppm (Fort Chipewyan) to 0.080 ppm (Tomahwak) (Table 18).

The median ozone concentration for the Gregoire Lake Area survey was 0.031 ppm. Typical median O_3 levels at permanent continuous monitoring stations in Alberta range from 0.020 ppm (Fort McKay) to 0.043 ppm (Steeper) based on 2001 data (Table 17). Lower median ozone concentrations were observed at sites that were monitored more frequently in the morning and higher median levels were measured at sites that were monitored in the afternoon. Higher ozone levels are often observed in the afternoon due to the ozone formation process, which requires the presence of sunlight. Increased volatilisation of VOCs resulting from warmer temperatures and increased vertical mixing of the atmosphere can contribute to an increase in ozone levels later in the day. The overall median ozone concentration at the three WBEA stations that report ozone ranged from 0.025 to 0.027 ppm. Ozone levels in large cities are generally much lower than rural areas. Median ozone levels at permanent monitoring stations in Edmonton and Calgary in 2001 ranged from 0.014 to 0.024 ppm (Table 17). Lower ozone levels in urban centres are due to the destruction of natural O_3 by NO emitted by vehicles.

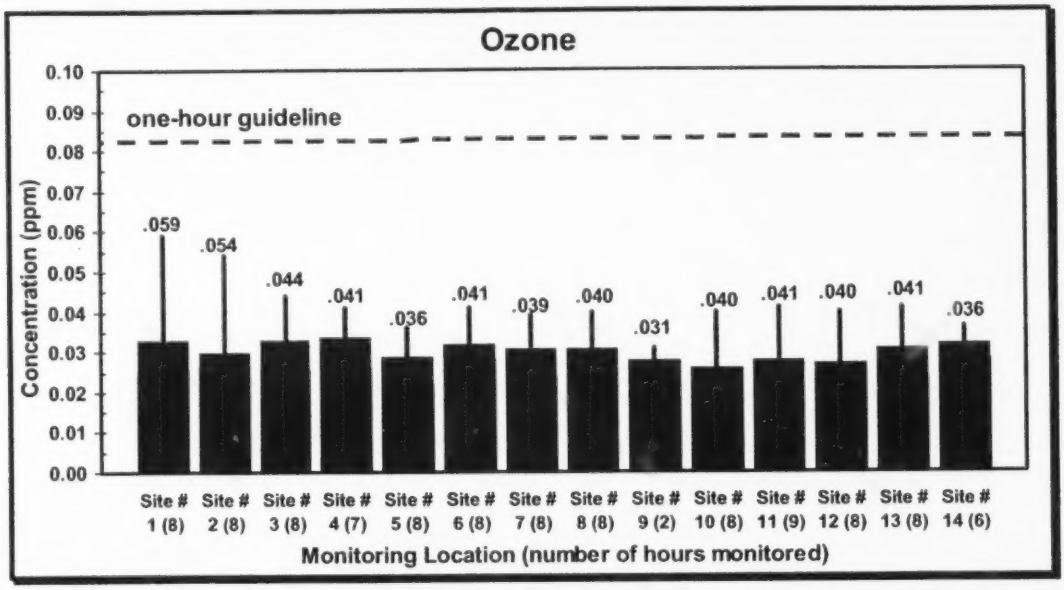


Figure 11. One-hour median and maximum concentrations for ozone

Particulate Matter (TSP, PM_{10} and $PM_{2.5}$)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
TSP = 1764 µg/m^3	no guideline
PM_{10} = 915 µg/m^3	no guideline
$PM_{2.5}$ = 60 µg/m^3	no guideline

Not all air pollutants exist in a gaseous form. Tiny particles of solid material or liquid droplets, defined collectively as particulate matter (PM), are also present in the atmosphere. Total suspended particulates (TSP) refer to all particles up to 500 microns in diameter (a human hair is about 100 microns in diameter) and are important primarily from a nuisance perspective. Particles less than or equal to 10 micrometres in aerodynamic diameter (PM_{10}) can be inhaled, while smaller particles, less than or equal to 2.5 micrometres in aerodynamic diameter ($PM_{2.5}$), can penetrate deep into the lungs. Sources of coarse particulates (TSP, PM_{10}) include windblown dust, resuspended road dust, agricultural dust (e.g. during harvest), smoke from forest fires and recreational wood burning, vehicle emissions, brake and tire wear, and industrial emissions. Fine particles ($PM_{2.5}$) are found in the atmosphere because of combustion processes and condensation from sources such as vehicles, industrial facilities and wood burning. $PM_{2.5}$ are also formed as a result of reactions of gaseous chemicals in the air. Particulate matter levels will vary depending on wind speed, precipitation and snow cover.

One hour concentrations of PM ranged from less than 1 to 60 µg/m^3 for $PM_{2.5}$, less than 1 to 915 µg/m^3 for PM_{10}, and 1 to 1764 µg/m^3 for TSP. There are no one-hour guidelines in Alberta for particulate matter. The median concentration was 1 µg/m^3 for $PM_{2.5}$, 7 µg/m^3 for PM_{10}, and 12 µg/m^3 for TSP (Table 5). The Alberta 24-hour average ambient air quality guideline for TSP is 100 µg/m^3; the proposed 24-hour Canada-wide Standard (CWS) is 30 µg/m^3 for $PM_{2.5}$ over a 24 hour averaging time, based on the 98th percentile ambient measurement annually averaged over three consecutive years. Alberta Environment has estimated that the CWS is equivalent to a one-hour concentration of approximately 80 µg/m^3 based on Calgary and Edmonton data[2]. $PM_{2.5}$ concentrations measured during the survey were below 80 µg/m^3, however levels of TSP and PM_{10} were high at times.

Maximum one-hour average TSP, PM_{10} and $PM_{2.5}$ levels measured in this survey were 1764, 915, and 59 µg/m^3 (Table 7). These levels were detected at Site #14 on September 14, 2000. Maximum TSP levels from other MAML surveys ranged from 52 mg/m^3 (Caroline/Sundre area 1997/1998) to 2305 mg/m^3 (County of Grande Prairie 1998/1999). Maximum levels of PM_{10} from other MAML surveys rated from 43 µg/m^3 (Caroline/Sundre area 1997/1998) to 1287 µg/m^3 (County of Grande Prairie 1998/1999). Maximum levels of $PM_{2.5}$ ranged from 12 µg/m^3 (City of Medicine Hat 1998/1999) to 294 µg/m^3 (City of Lethbridge 1998/1999) in other MAML surveys. Please refer to Table 18 for the data set.

High particulate concentrations were recorded at several sites during this survey. The major source of particulates at monitoring locations in the Gregoire Lake

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2 Alberta Environment. June 2000. *One-Hour Equivalent of a 24-Hour Average Particulate Matter Standard and its Potential Application in the Index of the Quality of Air (IQUA).* Presented at the Canadian Prairie and Northern Section of the Air and Waste Management Association Annual General Meeting.

Area was road dust from traffic travelling on roads adjacent to the monitoring locations.

Median TSP values in the survey were 12 $\mu g/m^3$. Median TSP levels recorded during other mobile monitoring surveys in Alberta ranged from 4 $\mu g/m^3$ (Caroline/Sundre area 1997/1998) to 74 $\mu g/m^3$ (Bow Corridor 1999/2000).The median PM_{10} value for the survey was 7 $\mu g/m^3$. Median PM_{10} levels from other MAML surveys ranged from 3 $\mu g/m^3$ (Caroline/Sundre area 1997/1998) to 40 $\mu g/m^3$ (Bow Corridor 1999/2000 and Whitecourt 2001). The median $PM_{2.5}$ concentration for the survey was 1 $\mu g/m^3$, which is the minimum detectable limit.

Therefore 50% of the data for $PM_{2.5}$ was below the minimum detectable limit. Median $PM_{2.5}$ levels in other MAML surveys ranged from less than 1 $\mu g/m^3$ (Caroline/Sundre area 1997/1998) to 4 $\mu g/m^3$ (Bow Corridor 1999/2000 and Whitecourt 2001(Table 17).

Three stations in the WBEA collect respirable particulates ($PM_{2.5}$). Maximum levels of $PM_{2.5}$ ranged from 15 $\mu g/m^3$ at the Athabasca Valley station to 27 $\mu g/m^3$ at the Fort McKay and Patricia McInnes stations. The overall median value of $PM_{2.5}$ collected at these three stations ranged from 5 to 6 $\mu g/m^3$ (Table 6).

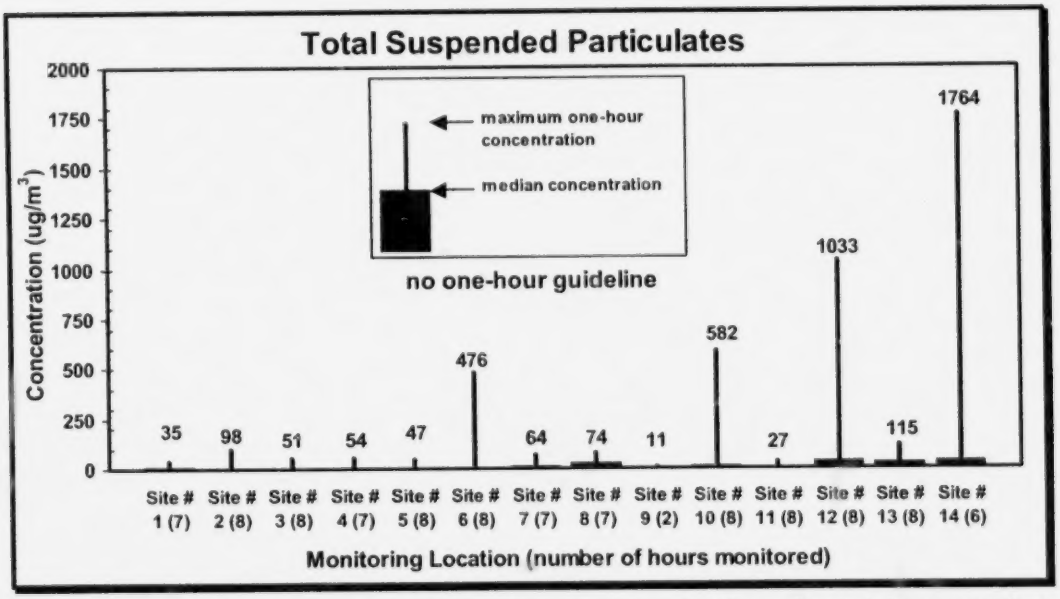

Figure 12. One-hour median and maximum concentrations for total suspended particulates

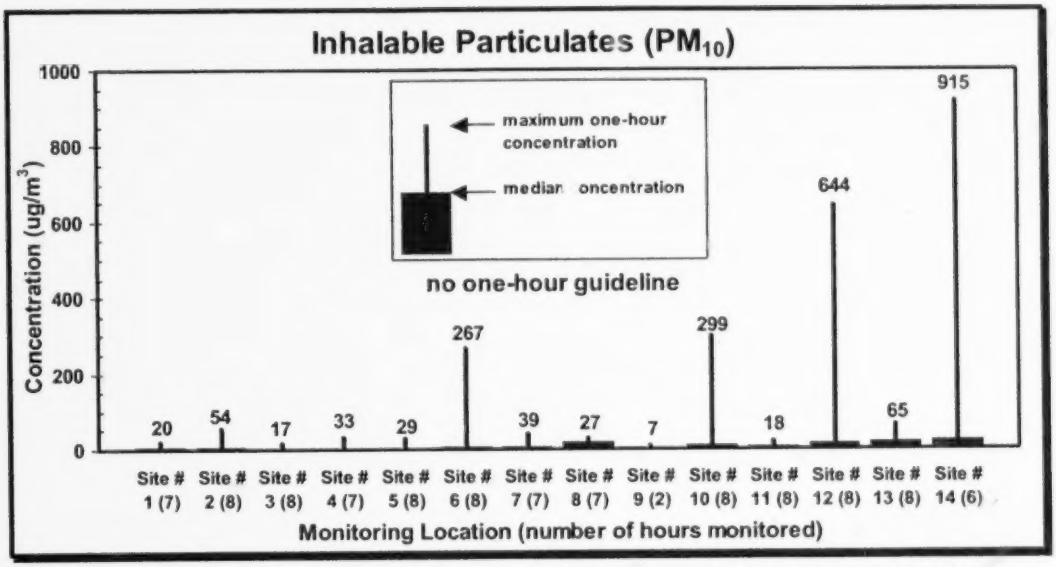

Figure 13. One-hour median and maximum concentrations for inhalable particulates

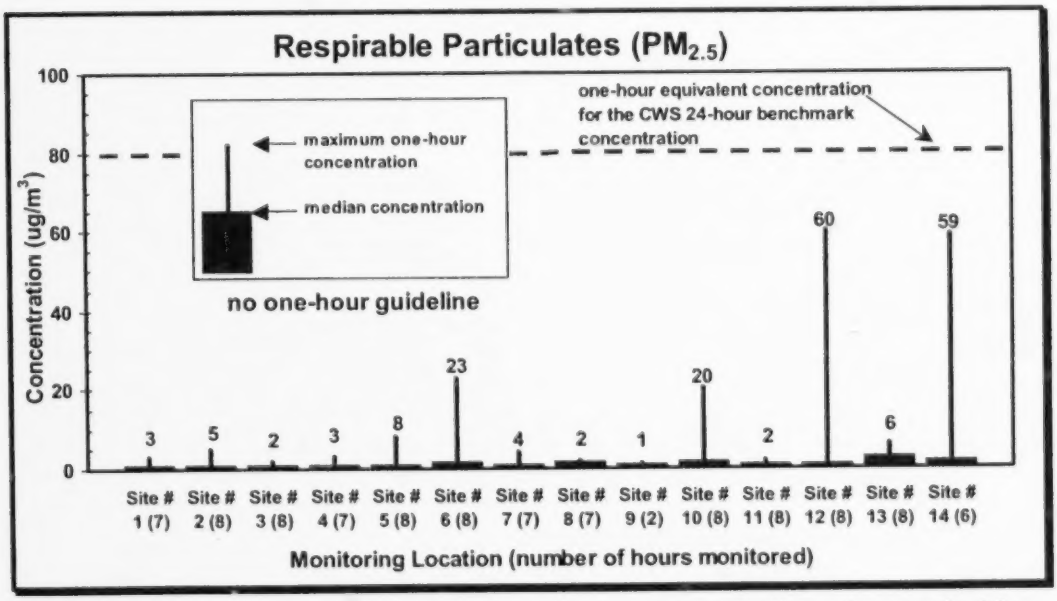

Figure 14. One-hour median and maximum concentrations for respirable particulates

Polycyclic Aromatic Hydrocarbons (PAHs)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
16 $\mu g/m^3$	no guideline

Polycyclic aromatic hydrocarbons (PAHs) are a class of chemicals that are formed during the incomplete combustion of gasoline, diesel, oil, coal, wood, garbage or other organic substances. Tobacco smoke and charbroiled meats are common sources of PAHs. Other outdoor PAH sources include vehicle emissions, wood smoke from fireplaces, smoke from forest fires and industrial emissions. There are more than 100 different PAHs with varying levels of toxicity. PAHs occur in the atmosphere in the vapour phase or attached to dust particles. The PAH monitoring instrument aboard the MAML analyzes only particulate bound PAHs.

One hour concentrations of polycyclic aromatic hydrocarbons (PAHs) ranged from less than 3.0 ng/m^3 (nanograms per cubic metre) to 16 ng/m^3. The median concentration was below the minimum detectable limit of 3 ng/m^3. Alberta does not have a one-hour guideline for PAHs. Please refer to Tables 9-12 for the data set.

The maximum one-hour average PAH concentration of 16 ng/m^3 was recorded at Site #6 on May 18, 2000 (Table 7). Maximum PAH levels measured during previous air quality surveys in Alberta ranged from 11 ng/m^3 in the Lethbridge area (1998/1999) to 36 ng/m^3 in the Whitecourt/Swan Hills area (2001) (Table 18).

The overall median PAH concentration at all sites in the Gregoire Lake Area survey was less than 3 ng/m^3 (Table 5). In comparison, median PAH levels measured during air quality surveys in the Alberta rated from less than 3 to 5 ng/m^3 in the City of Medicine Hat (1998/1999)(Table 17). PAHs are not routinely monitored on an hourly basis at WBEA monitoring stations.

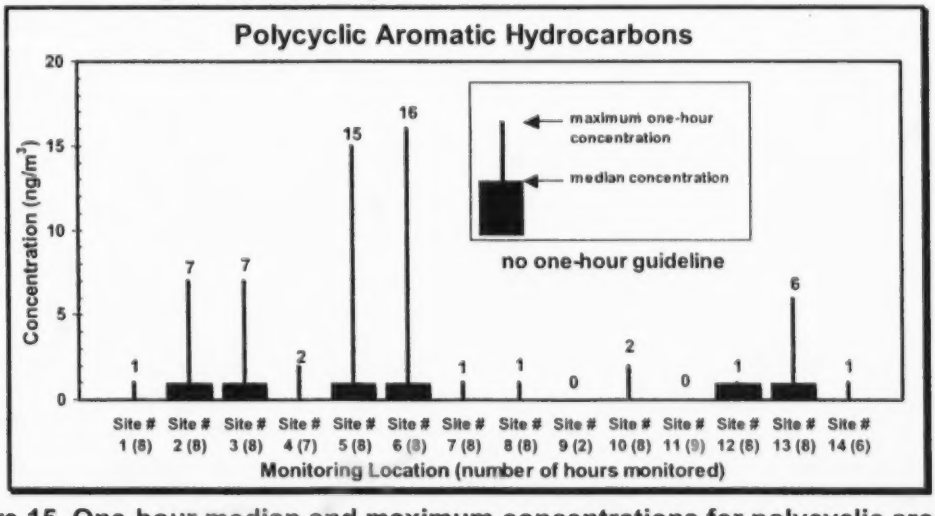

Figure 15. One-hour median and maximum concentrations for polycyclic aromatic hydrocarbons

Sulphur Dioxide (SO_2)

maximum one-hour concentration recorded during survey	one-hour AAAQ guideline
0.011 ppm	0.172 ppm

Sulphur dioxide (SO_2) is a colourless gas with a pungent odour. In Alberta, it is estimated that 45% of SO_2 emissions are produced by natural gas processing plants while oil sands and power plants produce about 26% and 21% of SO_2 emissions, respectively[3]. Other sources include gas plant flares, oil refineries, pulp and paper mills and fertilizer plants.

None of the SO_2 concentrations measured in this survey exceeded the one-hour Alberta ambient air quality guideline of 0.172 ppm. One-hour average concentrations of sulphur dioxide (SO_2) in the survey area ranged from less than 0.0006 ppm to a maximum of 0.011 ppm, which represents 6% of the one-hour guideline. The median SO_2 concentration was less than the instrumental lower detection limit of 0.0006(Tables 5 and 7).

The maximum one-hour concentration of 0.011 ppm was measured at Site #3 on December 8, 2000 (Table 7). Maximum one-hour concentrations from other MAML surveys ranged from 0.004 ppm in the Lethbridge area survey (1998/1999) to 0.092 ppm during the Bow Corridor survey (1999/2000). In 2001, Maximum one-hour SO_2 concentrations at permanent monitoring stations in Alberta ranged from 0.006 ppm (Steeper in west-central Alberta) to 0.231 ppm (Buffalo Viewpoint - north of Fort McMurray). Please refer to Table 18 for the data set.

[3] *Environment Canada. 1998. 1995 Criteria Air Contaminant Emissions Inventory Summaries. Pollution Data Branch, Environment Canada. http://www2.ec.gc.ca/pdb/cac/cac.html.*

The median SO_2 concentration was less than the minimum detectable limit of 0.0006 ppm. In comparison, median SO_2 concentrations from previous MAML surveys in Alberta ranged from less than 0.0006 ppm to 0.004 ppm in the Whitecourt/Swan Hills area (2001). Please refer to Table 17 for the data set.

Typical median SO_2 concentrations at eight permanent monitoring stations in the WBEA network range from less than 0.0006 ppm to 0.003 ppm (Tables 6 and 8).

Figure 16. Site #10

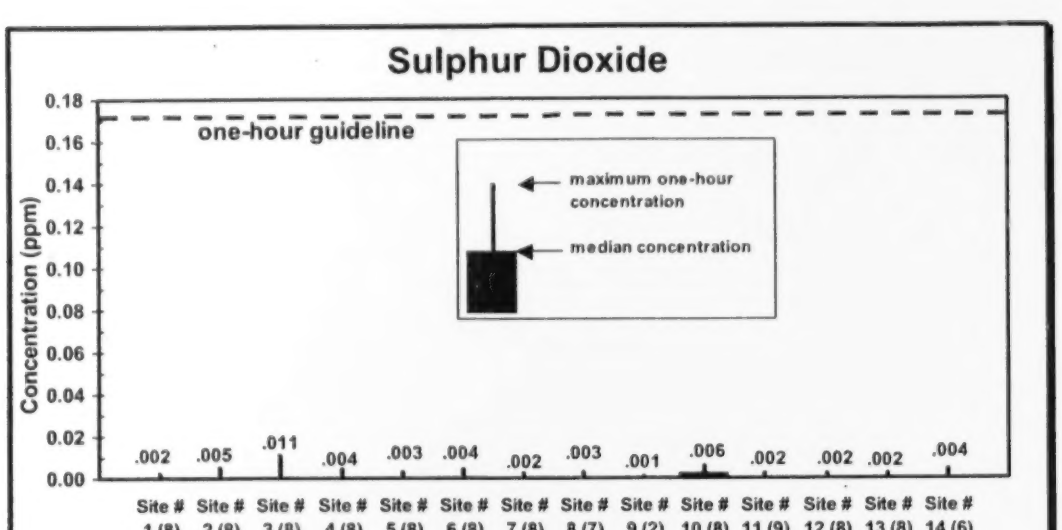

Figure 17. One-hour median and maximum concentrations for sulphur dioxide.

Table 5. *Median* one-hour air quality parameter concentrations at each monitoring site in the Gregoire Lake Area. (May, June, September and December 2000)

Monitoring Location (# of hours sampled)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
Site# 1 (8 hrs)	0.1	0.033	2.0	1.8	0.1	0.000	0.001	0.001	0.001	0.000	0.000	0.000	12	7	1	0
Site# 2 (8 hrs)	0.1	0.030	1.9	1.8	0.0	0.000	0.001	0.002	0.003	0.000	0.001	0.000	10	6	1	1
Site# 3 (8 hrs)	0.2	0.033	2.0	1.9	0.1	0.001	0.007	0.005	0.010	0.003	0.001	0.000	7	4	1	1
Site# 4 (8 hrs)	0.1	0.034	2.0	1.9	0.0	0.000	0.004	0.002	0.008	0.001	0.000	0.000	7	4	1	0
Site# 5 (8 hrs)	0.1	0.029	2.1	1.9	0.1	0.000	0.005	0.002	0.005	0.001	0.000	0.000	9	5	1	1
Site# 6 (8 hrs)	0.1	0.032	2.0	1.9	0.0	0.000	0.002	0.002	0.003	0.000	0.000	0.000	11	8	2	1
Site# 7 (8 hrs)	0.1	0.031	2.0	2.0	0.0	0.000	0.001	0.002	0.004	0.000	0.000	0.000	12	7	1	0
Site# 8 (8 hrs)	0.1	0.031	2.0	2.0	0.1	0.000	0.000	0.001	0.002	0.000	0.000	0.000	29	19	2	0
Site# 9 (2 hrs)	0.0	0.028	2.0	1.9	0.2	0.001	0.004	0.002	0.004	0.002	0.000	0.000	8	5	1	0
Site# 10 (8 hrs)	0.1	0.026	2.3	2.1	0.3	0.003	0.003	0.004	0.006	0.002	0.002	0.001	17	11	2	0
Site# 11 (9 hrs)	0.1	0.028	1.7	1.7	0.0	0.001	0.001	0.001	0.001	0.000	0.000	0.000	10	7	1	0
Site# 12 (8 hrs)	0.1	0.027	1.9	1.9	0.0	0.000	0.002	0.001	0.003	0.000	0.001	0.000	39	17	1	1
Site# 13 (8 hrs)	0.2	0.031	2.1	2.1	0.0	0.001	0.001	0.000	0.001	0.000	0.001	0.000	32	19	3	1
Site# 14 (6 hrs)	0.1	0.032	2.1	2.0	0.0	0.000	0.003	0.002	0.003	0.001	0.000	0.000	41	22	2	0
Overall Median	0.1	0.031	2.0	1.9	0.0	0.000	0.002	0.002	0.003	0.000	0.000	0.000	12	7	1	0
One-Hour Guideline	**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

Table 6. *Overall median* air quality parameter concentrations in the Gregoire Lake Area and at the WBEA* stations. (May, June, September and December 2000)

Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
Gregoire Lake Area	0.1	0.031	2.0	1.9	0.0	0.000	0.002	0.002	0.003	0.000	0.000	0.000	12	7	1	0
Fort McKay	no data		1.8	no data		0.000	0.001	0.004	0.007	no data	0.000	no data			5	no data
Mildred Lake	no data		1.8	no data		0.001	no data					0.000	no data			
Lower Camp	no data		1.9	no data		0.003	no data					0.000	no data			
Buffalo Viewpoint	no data		1.9	no data		0.000	no data					0.000	no data			
Mannix	no data		1.9	no data		0.001	no data					0.000	no data			
Patricia McInnes	no data	0.027	1.8	no data		0.000	0.001	0.002	0.003	no data	0.000	no data			6	no data
Fort Chipewyan	no data	0.027	no data			0.000	0.000	0.000	0.000	no data		no data				
Athabasca Valley	0.2	0.025	1.9	no data		0.000	0.002	0.004	0.006	no data	0.000	no data			6	no data
One-Hour Guideline	**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

*(WBEA) - Wood Buffalo Environmental Association n/a No one hour guideline. ng/m^3 - nanograms per cubic metre of air

no data - Indicates that the analyzer was not operational for the indicated time period. ug/m^3 micrograms per cubic metre of air ppm - parts per million

Table 7. *Maximum* air quality parameter concentrations at each monitoring site in the Gregoire Lake Area. (May, June, September and December 2000)

Monitoring Location (# of hours sampled)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
Site# 1 (8 hrs)	0.2	**0.059**	2.4	2.0	0.6	0.002	0.005	0.003	0.005	0.006	**0.004**	0.000	35	20	3	1
Site# 2 (8 hrs)	0.2	0.054	2.1	2.0	0.2	0.005	0.005	0.005	0.008	0.003	0.003	0.000	98	54	5	7
Site# 3 (8 hrs)	0.3	0.044	2.5	2.1	0.5	**0.011**	**0.024**	**0.011**	**0.034**	0.006	**0.004**	0.000	51	17	2	7
Site# 4 (8 hrs)	0.2	0.041	2.6	2.1	0.2	0.004	0.011	0.006	0.012	**0.007**	0.001	0.001	54	33	3	2
Site# 5 (8 hrs)	0.3	0.036	2.5	2.0	0.5	0.003	0.008	0.009	0.013	0.005	0.003	0.000	47	29	8	15
Site# 6 (8 hrs)	**0.5**	0.041	2.7	2.1	0.2	0.004	0.011	0.009	0.018	0.003	0.003	0.000	476	267	23	**16**
Site# 7 (8 hrs)	0.2	0.039	2.6	2.1	0.3	0.002	0.011	0.005	0.013	0.002	0.001	0.001	64	39	4	1
Site# 8 (8 hrs)	0.2	0.040	2.5	2.1	0.3	0.003	0.005	0.004	0.007	0.000	0.002	0.000	74	27	2	1
Site# 9 (2 hrs)	0.1	0.031	2.0	1.9	0.3	0.001	0.005	0.002	0.004	0.005	0.000	0.001	11	7	1	0
Site# 10 (8 hrs)	0.3	0.040	**5.0**	**4.6**	**1.8**	0.006	0.005	0.009	0.010	0.004	**0.004**	**0.002**	582	299	20	2
Site# 11 (9 hrs)	0.2	0.041	2.2	1.8	0.3	0.002	0.004	0.004	0.006	0.004	0.003	0.001	27	18	2	0
Site# 12 (8 hrs)	0.2	0.040	2.0	2.1	0.1	0.002	0.007	0.001	0.008	0.001	0.002	**0.002**	1033	644	**60**	1
Site# 13 (8 hrs)	0.3	0.041	2.2	2.2	0.1	0.002	0.005	0.001	0.004	0.002	**0.004**	0.001	115	65	6	6
Site# 14 (6 hrs)	0.2	0.036	2.6	2.1	0.1	0.004	0.005	0.004	0.008	0.003	0.003	0.000	**1764**	**915**	59	1
One-Hour Maximum	**0.5**	**0.059**	**5.0**	**4.6**	**1.8**	**0.011**	**0.024**	**0.011**	**0.034**	**0.007**	**0.004**	**0.002**	**1764**	**915**	**60**	**16**
One-Hour Guideline	**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

Table 8. *Overall maximum* air quality parameter concentrations in the Gregoire Lake Area and at the WBEA* stations. (May, June, September and December 2000)

Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
Gregoire Lake Area	0.5	0.059	5.0	4.6	1.8	0.011	0.024	0.011	0.034	0.007	0.004	0.002	1764	915	60	16
Fort McKay	no data		3.0	no data		0.011	0.017	0.026	0.037	no data	0.002	no data			27	no data
Mildred Lake	no data		2.8	no data		0.072	no data					0.002	no data			
Lower Camp	no data		2.6	no data		0.047	no data					0.007	no data			
Buffalo Viewpoint	no data		2.8	no data		0.033	no data					0.003	no data			
Mannix	no data		2.6	no data		0.056	no data					0.003	no data			
Patricia McInnes	no data	0.049	2.5	no data		0.008	0.034	0.023	0.053	no data	0.001	no data			27	no data
Fort Chipewyan	no data	0.037	no data			0.006	0.002	0.005	0.006	no data		no data				
Athabasca Valley	0.6	0.048	2.5	no data		0.008	0.029	0.029	0.050	no data	0.001	no data			15	no data
One-Hour Guideline	**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

*(WBEA) - Wood Buffalo Environmental Association n/a No one hour guideline. ng/m^3 - nanograms per cubic metre of air

no data - Indicates that the analyzer was not operational for the indicated time period. ug/m^3 - micrograms per cubic metre of air ppm - parts per million

Table 9. *One-hour average* air quality parameter concentrations at each monitoring site in the Gregoire Lake Area. (May 15 to 19, 2000)

Date	Time (M.S.T.)	Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
15-May	2:18 p.m. to 3:26 p.m.	Site # 1	0.0	0.035	2.0	1.9	0.1	0.000	0.001	0.000	0.002	0.000	0.001	0.000	no data			0
	3:32 p.m. to 4:42 p.m.	Site # 2	0.0	0.034	2.1	1.9	0.1	0.002	0.005	0.004	0.008	0.001	0.003	0.000	13	8	1	1
	5:24 p.m. to 6:33 p.m.	Site # 3	0.2	0.033	2.2	2.1	0.1	0.002	0.007	0.005	0.009	0.002	0.003	0.000	2	1	0	2
16-May	8:46 a.m. to 9:48 a.m.	Site # 4	0.1	0.041	2.1	1.9	0.2	0.000	0.008	0.002	0.010	0.001	0.000	0.000	2	1	0	0
	9:54 a.m. to 10:57 a.m.	Site # 5	0.0	0.027	2.1	1.9	0.2	0.000	0.008	0.002	0.010	0.002	0.000	0.000	2	2	0	0
	11:03 a.m. to 12:08 p.m.	Site # 6	0.0	0.030	2.0	1.9	0.1	0.000	0.005	0.000	0.005	0.000	0.000	0.000	1	1	0	0
	12:16 p.m. to 1:18 p.m.	Site # 7	0.0	0.032	2.0	1.9	0.1	0.000	0.004	0.001	0.004	0.000	0.000	0.000	5	2	0	0
	1:23 p.m. to 2:34 p.m.	Site # 8	0.0	0.034	2.0	1.9	0.1	0.000	0.003	0.001	0.003	0.000	0.000	0.000	8	5	1	0
	2:42 p.m. to 3:46 p.m.	Site # 9	0.0	0.031	2.0	1.9	0.1	0.000	0.005	0.002	0.004	0.005	0.000	0.000	6	4	0	0
	5:07 p.m. to 6:11 p.m.	Site # 10	0.0	0.031	2.4	2.1	0.4	0.006	0.005	0.005	0.008	0.002	0.003	0.001	5	3	0	0
	7:37 p.m. to 8:40 p.m.	Site # 11	0.1	0.024	1.9	1.8	0.2	0.001	0.004	0.002	0.005	0.001	0.003	0.000	1	1	0	0
17-May	12:11 p.m. to 1:11 p.m.	Site # 12	0.1	0.030	1.9	1.8	0.1	0.000	0.004	0.001	0.004	0.000	0.001	0.002	1	0	0	0
	1:12 p.m. to 2:14 p.m.		0.1	0.029	1.9	1.8	0.1	0.000	0.003	0.001	0.004	0.000	0.001	0.001	1	0	0	0
	2:55 p.m. to 3:55 p.m.	Site # 13	0.1	0.033	1.9	1.9	0.1	0.001	0.004	0.000	0.003	0.000	0.003	0.001	43	29	3	1
	3:56 p.m. to 4:56 p.m.		0.2	0.032	2.0	1.9	0.1	0.002	0.005	0.001	0.004	0.002	0.004	0.001	40	26	3	1
	6:12 p.m. to 7:18 p.m.	Site # 10	0.2	0.028	2.7	2.2	0.6	0.004	0.004	0.001	0.004	0.000	0.004	0.002	14	10	1	1
18-May	9:24 a.m. to 10:29 a.m.	Site # 11	0.0	0.025	2.0	1.7	0.3	0.001	0.004	0.004	0.006	0.000	0.000	0.001	3	2	1	0
	11:04 a.m. to 12:06 p.m.	Site # 9	0.1	0.025	2.0	1.9	0.3	0.001	0.004	0.002	0.004	0.000	0.000	0.001	11	7	1	0
	12:13 p.m. to 1:17 p.m.	Site # 8	0.2	0.030	2.0	1.8	0.3	0.002	0.001	0.004	0.004	0.000	0.001	0.000	35	19	2	0
	1:21 p.m. to 2:26 p.m.	Site # 7	0.0	0.034	2.0	1.9	0.3	0.002	0.001	0.004	0.004	0.000	0.001	0.001	4	3	1	0
	2:35 p.m. to 3:38 p.m.	Site # 6	0.0	0.041	1.9	1.8	0.2	0.002	0.001	0.002	0.001	0.000	0.001	0.000	4	3	1	16
	3:45 p.m. to 4:46 p.m.	Site # 5	0.0	0.032	2.0	1.9	0.3	0.002	0.001	0.004	0.003	0.001	0.001	0.000	6	4	1	15
19-May	9:12 a.m. to 10:14 a.m.	Site # 4	0.0	0.037	1.8	1.7	0.1	0.000	0.004	0.004	0.009	0.000	0.000	0.001	7	4	1	1
	10:32 a.m. to 11:33 a.m.	Site # 3	0.1	0.044	1.9	1.7	0.2	0.002	0.002	0.001	0.003	0.000	0.002	0.000	10	6	1	0
	12:13 p.m. to 1:15 p.m.	Site # 2	0.1	0.054	1.9	1.6	0.2	0.000	0.001	0.005	0.006	0.000	0.000	0.000	79	43	5	7
	1:21 p.m. to 2:23 p.m.	Site # 1	0.2	0.059	2.0	1.7	0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	11	7	2	1
One-hour guideline			**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

List of Air Quality and Weather Parameters

ppm - parts per million
ug/m^3 - micrograms per cubic metre of air
ng/m^3 - nanograms per cubic metre of air
n/a No one hour guideline
no data Indicates that the analyzer was not operational for the indicated time period.

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane

RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide

NO_X - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide

PAH - polycyclic aromatic hydrocarbons
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates

Table 10. *One-hour average* air quality parameter concentrations at each monitoring site in the Gregoire Lake Area. (June 26 to 30, 2000)

Date	Time (M.S.T.)	Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
26-Jun	1:18 p.m. to 2:23 p.m.	Site # 1	0.1	0.033	1.8	1.8	0.0	0.000	0.000	0.000	0.001	0.001	0.000	0.000	11	6	0	0
	2:28 p.m. to 3:30 p.m.	Site # 2	0.2	0.034	1.8	1.8	0.0	0.002	0.001	0.001	0.001	0.003	0.000	0.000	10	6	0	0
	4:08 p.m. to 5:08 p.m.	Site # 3	0.2	0.033	1.9	1.9	0.1	0.000	0.000	0.001	0.001	0.001	0.000	0.000	4	3	0	1
	5:09 p.m. to 6:11 p.m.		0.2	0.030	2.3	1.8	0.4	0.000	0.006	0.002	0.006	0.004	0.000	0.000	4	3	0	1
27-Jun	8:35 a.m. to 9:37 a.m.	Site # 4	0.1	0.034	1.7	1.7	0.1	0.000	0.003	0.001	0.003	0.001	0.001	0.000	19	10	1	2
	9:42 a.m. to 10:43 a.m.	Site # 5	0.1	0.036	1.7	1.7	0.0	0.000	0.005	0.002	0.004	0.003	0.001	0.000	11	6	1	1
	11:31 a.m. to 12:37 p.m.	Site # 11	0.2	0.040	1.7	1.6	0.1	0.000	0.000	0.001	0.000	0.000	0.000	0.000	14	8	1	0
	1:14 p.m. to 2:15 p.m.	Site # 6	0.2	0.040	2.1	2.1	0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	20	14	2	0
	2:24 p.m. to 3:33 p.m.	Site # 7	0.1	0.039	2.1	2.1	0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	43	24	2	0
	3:46 p.m. to 4:47 p.m.	Site # 14	0.2	0.034	2.2	2.1	0.1	0.000	0.002	0.003	0.003	0.001	0.000	0.000	32	19	2	0
	5:06 p.m. to 6:08 p.m.	Site # 8	0.2	0.040	2.4	2.1	0.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	74	27	2	0
28-Jun	9:59 a.m. to 10:59 a.m.	Site # 12	0.2	0.040	1.8	1.7	0.0	0.000	0.001	0.001	0.001	0.001	0.002	0.000	429	259	21	1
	11:00 a.m. to 12:00 p.m.		0.1	0.040	1.9	1.8	0.1	0.000	0.000	0.001	0.001	0.001	0.001	0.000	1033	644	60	1
	12:58 p.m. to 1:59 p.m.	Site # 13	0.2	0.039	2.2	2.2	0.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	97	53	5	0
	2:00 p.m. to 2:59 p.m.		0.2	0.041	2.1	2.1	0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	115	65	6	0
	4:37 p.m. to 5:37 p.m.	Site # 10	0.1	0.040	5.0	4.6	1.8	0.003	0.001	0.004	0.004	0.004	0.002	0.001	30	17	2	0
	5:38 p.m. to 6:38 p.m.		0.1	0.038	2.2	2.3	0.3	0.002	0.004	0.001	0.002	0.004	0.001	0.000	21	13	2	0
29-Jun	8:35 a.m. to 9:38 a.m.	Site # 4	0.1	0.034	no data			0.000	0.011	0.001	0.012	0.007	0.000	0.000	54	29	3	0
	9:44 a.m. to 10:45 a.m.	Site # 5	0.1	0.035	no data			0.000	0.006	0.002	0.008	0.005	0.000	0.000	16	11	2	0
	11:38 a.m. to 12:38 p.m.	Site # 11	0.2	0.041	no data			0.001	0.001	0.002	0.001	0.004	0.000	0.000	13	8	1	0
	1:10 p.m. to 2:17 p.m.	Site # 6	0.2	0.034	no data			0.000	0.002	0.001	0.002	0.001	0.000	0.000	190	111	10	1
	2:42 p.m. to 3:43 p.m.	Site # 14	0.2	0.033	no data			0.000	0.003	0.002	0.003	0.000	0.000	0.000	156	105	11	0
	3:55 p.m. to 4:57 p.m.	Site # 7	0.2	0.032	no data			0.000	0.005	0.003	0.006	0.002	0.000	0.000	12	7	1	0
	5:02 p.m. to 6:04 p.m.	Site # 8	0.2	0.036	no data			0.000	0.003	0.002	0.004	0.000	0.000	0.000	41	21	2	0
30-Jun	10:17 a.m. to 11:20 a.m.	Site # 2	0.0	0.026	1.7	1.7	0.0	0.000	0.000	0.002	0.002	0.000	0.001	0.000	10	7	1	1
	11:26 a.m. to 12:27 p.m.	Site # 1	0.1	0.034	1.8	1.8	0.0	0.000	0.003	0.001	0.002	0.000	0.000	0.000	12	9	1	0
One-hour guideline			**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

List of Air Quality and Weather Parameters

ppm - parts per million
ug/m^3 - micrograms per cubic metre of air
ng/m^3 - nanograms per cubic metre of air
n/a No one hour guideline.
no data Indicates that the analyzer was not operational for the indicated time period.

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_X - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
PAH - polycyclic aromatic hydrocarbons
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates

Table 11. *One-hour average* air quality parameter concentrations at each monitoring site in the Gregoire Lake Area. (September 11 to 15, 2000)

Date	Time (M.S.T.)	Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
11-Sep	1:09 p.m. to 2:02 p.m.	Site # 1	0.1	0.0064	2.0	2.0	0.1	0.000	0.000	0.001	0.001	0.001	0.000	no data	19	11	1	1
	2:07 p.m. to 3:13 p.m.	Site # 2	0.0	0.0192	2.0	2.0	0.0	0.000	0.001	0.001	0.002	0.000	0.000	no data	10	6	1	1
	3:51 p.m. to 4:51 p.m.	Site # 3	0.1	0.0183	2.1	2.1	0.0	0.000	0.010	0.005	0.015	0.001	0.000	no data	27	14	1	4
	4:52 p.m. to 5:55 p.m.		0.2	0.0105	2.5	2.1	0.5	0.001	0.024	0.011	0.034	0.003	0.000	no data	27	17	2	7
12-Sep	7:24 a.m. to 8:26 a.m.	Site # 4	no data					0.000	no data				0.000	no data	no data			
	8:32 a.m. to 9:42 a.m.	Site # 5	0.1	0.0169	1.9	1.9	0.0	0.000	0.005	0.000	0.005	0.001	0.000	no data	7	4	1	0
	10:10 a.m. to 11:12 a.m.	Site # 11	0.1	0.0174	1.7	1.7	0.0	0.000	0.002	0.000	0.002	0.000	0.000	no data	7	6	1	0
	11:44 a.m. to 12:50 p.m.	Site # 6	0.1	0.018	2.0	1.9	0.0	0.000	0.003	0.001	0.004	0.000	0.000	no data	17	11	1	1
	1:12 p.m. to 2:15 p.m.	Site # 14	0.1	0.0218	2.1	2.0	0.1	0.000	0.005	0.004	0.008	0.002	0.000	no data	50	25	2	1
	2:28 p.m. to 3:32 p.m.	Site # 7	0.1	0.0258	2.1	2.0	0.0	0.000	0.000	0.000	0.000	0.000	0.000	no data	12	9	1	0
	3:38 p.m. to 4:49 p.m.	Site # 8	0.1	0.0264	2.1	2.0	0.2	0.000	0.000	0.000	0.000	0.000	0.000	no data	14	8	1	1
13-Sep	9:16 a.m. to 10:16 a.m.	Site # 12	0.0	0.0189	2.0	2.1	0.0	0.000	0.001	0.001	0.002	0.000	0.000	no data	85	40	3	0
	10:17 a.m. to 11:18 a.m.		0.0	0.0199	2.0	2.0	0.0	0.000	0.000	0.000	0.000	0.000	0.000	no data	77	34	3	0
	12:39 p.m. to 1:39 p.m.	Site # 13	0.0	0.021	2.1	2.1	0.0	0.000	0.000	0.000	0.000	0.000	0.000	no data	12	8	1	0
	1:40 p.m. to 2:41 p.m.		0.1	0.0225	2.1	2.1	0.0	0.000	0.000	0.000	0.000	0.000	0.000	no data	24	11	1	0
	4:01 p.m. to 5:01 p.m.	Site # 10	0.3	0.0232	1.9	2.0	0.1	0.000	0.004	0.004	0.007	0.000	0.000	no data	582	299	20	2
	5:02 p.m. to 6:04 p.m.		0.1	0.0201	2.4	2.0	0.5	0.000	0.000	0.000	0.000	0.000	0.000	no data	488	215	19	0
14-Sep	8:05 a.m. to 9:07 a.m.	Site # 4	0.1	0.0222	2.0	2.1	0.0	0.000	0.006	0.002	0.008	0.001	0.000	no data	48	33	3	0
	9:23 a.m. to 10:25 a.m.	Site # 8	0.1	0.0287	1.9	2.0	0.0	0.000	0.005	0.002	0.007	0.000	0.000	no data	29	21	2	1
	10:30 a.m. to 11:32 a.m.	Site # 7	0.1	0.029	2.0	2.0	0.0	0.001	0.011	0.005	0.013	0.002	0.000	no data	64	39	4	1
	11:44 a.m. to 12:46 p.m.	Site # 14	0.1	0.0361	1.9	1.9	0.0	0.000	0.003	0.001	0.004	0.003	0.000	no data	1764	915	59	1
	1:05 p.m. to 2:06 p.m.	Site # 6	0.1	0.0347	1.9	1.9	0.0	0.001	0.010	0.009	0.018	0.002	0.000	no data	476	267	23	12
	2:32 p.m. to 3:32 p.m.	Site # 11	0.0	0.0379	1.7	1.7	0.0	0.001	0.001	0.000	0.001	0.000	0.000	no data	25	17	2	0
	3:33 p.m. to 4:25 p.m.		0.0	0.0376	1.7	1.7	0.0	0.000	0.001	0.000	0.001	0.001	0.000	no data	27	18	2	0
	4:51 p.m. to 5:54 p.m.	Site # 5	0.0	0.0365	2.3	1.9	0.5	0.000	0.004	0.002	0.005	0.001	0.000	no data	47	29	3	0
15-Sep	10:09 a.m. to 11:12 a.m.	Site # 2	0.1	0.025	1.9	1.9	0.0	0.000	0.005	0.001	0.005	0.000	0.000	no data	98	54	4	4
	11:18 a.m. to 12:26 p.m.	Site # 1	0.1	0.0293	2.4	1.8	0.6	0.000	0.002	0.000	0.001	0.000	0.000	no data	35	20	2	0
One-hour guideline			**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

List of Air Quality and Weather Parameters

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ug/m^3 - micrograms per cubic metre of air
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n/a No one hour guideline.
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CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane

RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide

NO_X - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide

PAH - polycyclic aromatic hydrocarbons
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates

Table 12. *One-hour average* air quality parameter concentrations at each monitoring site in the Gregoire Lake Area. (December 4 to 8, 2000)

Date	Time (M.S.T.)	Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ug/m^3			ng/m^3
4-Dec	1:21 p.m. to 2:22 p.m.	Site # 1	0.2	0.0274	2.0	2.0	0.0	0.002	0.005	0.003	0.005	0.006	0.004	0.000	9	6	3	1
	2:29 p.m. to 3:30 p.m.	Site # 2	0.1	0.0268	2.1	2.0	0.1	0.000	0.001	0.002	0.003	0.000	0.001	0.000	4	2	1	1
5-Dec	9:23 a.m. to 10:25 a.m.	Site # 4	0.2	0.0183	2.6	2.0	0.0	0.001	0.004	0.001	0.005	0.000	0.000	0.000	4	4	2	0
	10:30 a.m. to 11:31a.m.	Site # 5	0.2	0.020	2.5	2.0	0.0	0.002	0.003	0.001	0.004	0.000	0.000	0.000	12	11	8	1
	12:00 p.m. to 1:01 p.m.	Site # 11	0.2	0.020	2.2	1.7	0.0	0.002	0.003	0.001	0.003	0.004	0.001	0.000	8	4	2	0
	1:29 p.m. to 2:30 p.m.	Site # 6	0.5	0.0183	2.7	2.1	0.0	0.004	0.011	0.008	0.017	0.003	0.003	0.000	6	5	2	1
	2:54 p.m. to 3:55 p.m.	Site # 14	0.2	0.0187	2.6	2.0	0.0	0.004	0.003	0.003	0.006	0.003	0.003	0.000	9	5	2	0
	4:16 p.m. to 5:17 p.m.	Site # 7	0.2	0.017	2.6	2.0	0.0	0.001	0.000	0.003	0.004	0.000	0.000	0.000	6	5	2	1
	5:23 p.m. to 6:24 p.m.	Site # 8	0.2	0.0183	2.5	2.0	0.0	0.001	0.000	0.002	0.002	0.000	0.000	0.000	5	4	2	1
6-Dec	10:46 a.m. to 11:45 a.m.	Site # 12	0.2	0.0244	1.9	2.0	0.0	0.002	0.007	0.001	0.008	0.000	0.001	0.000	1	1	0	1
	11:46 a.m. to 12:47p.m.		0.2	0.025	1.9	2.0	0.0	0.002	0.004	0.001	0.004	0.000	0.001	0.000	1	1	0	1
	1:30 p.m. to 2:29 p.m.	Site # 13	0.3	0.0272	2.1	2.1	0.0	0.001	0.002	0.001	0.003	0.000	0.001	0.000	5	4	3	6
	2:30 p.m. to 3:31 p.m.		0.3	0.030	2.1	2.1	0.0	0.001	0.002	0.000	0.002	0.000	0.001	0.000	6	4	3	6
	4:35 p.m. to 5:34 p.m.	Site # 10	0.2	0.010	2.1	2.1	0.0	0.005	0.003	0.009	0.010	0.002	0.003	0.000	3	2	1	1
	5:35 p.m. to 6:36 p.m.		0.2	0.0133	2.2	2.1	0.1	0.005	0.002	0.009	0.009	0.002	0.004	0.000	3	2	1	1
7-Dec	9:11 a.m. to 10:12 a.m.	Site # 4	0.2	0.0213	2.0	1.9	0.0	0.004	0.001	0.006	0.007	0.000	0.000	0.000	6	2	1	0
	10:48 a.m. to 11:49 a.m.	Site # 11	0.2	0.0282	1.6	1.7	0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	no data			0
	12:18 p.m. to 1:19 p.m.	Site # 7	0.1	0.0309	1.9	1.9	0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	no data			0
	1:23 p.m. to 2:24 p.m.	Site # 8	0.1	0.0324	1.9	1.9	0.0	0.003	0.000	0.001	0.000	0.000	0.002	0.000	no data			0
	2:34 p.m. to 3:35 p.m.	Site # 14	0.1	0.0316	1.9	1.9	0.0	0.002	0.001	0.001	0.000	0.000	0.002	0.000	3	2	1	0
	3:44 p.m. to 4:45 p.m.	Site # 6	0.1	0.0275	1.9	1.9	0.0	0.000	0.000	0.003	0.001	0.000	0.000	0.000	3	2	1	1
	5:07 p.m. to 6:08 p.m.	Site # 5	0.3	0.020	2.1	2.0	0.1	0.003	0.005	0.009	0.013	0.001	0.003	0.000	4	3	1	3
8-Dec	10:20 a.m. to 11:19 a.m.	Site # 3	0.3	0.0337	2.0	1.9	0.0	0.004	0.010	0.005	0.013	0.006	0.003	0.000	2	2	1	1
	11:20 a.m. to 12:21p.m.		0.3	0.0335	2.0	1.9	0.1	0.011	0.006	0.006	0.011	0.006	0.004	0.000	51	7	1	1
	1:04 p.m. to 2:05 p.m.	Site # 2	0.2	0.0358	1.8	1.7	0.0	0.005	0.001	0.001	0.001	0.000	0.003	0.000	8	1	0	0
	2:10 p.m. to 3:11 p.m.	Site # 1	0.2	0.0359	1.9	1.7	0.2	0.002	0.000	0.001	0.001	0.000	0.001	0.000	17	2	0	0
One-hour guideline			**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.170**	**n/a**	**0.210**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

List of Air Quality and Weather Parameters

ppm - parts per million

ug/m^3 - micrograms per cubic metre of air

ng/m^3 - nanograms per cubic metre of air

n/a No one hour guideline.

no data Indicates that the analyzer was not operational for the indicated time period.

CO - carbon monoxide

O_3 - ozone

THC - total hydrocarbons

CH_4 - methane

RHC - reactive hydrocarbons

SO_2 - sulphur dioxide

NO - nitric oxide

NO_2 - nitrogen dioxide

NO_X - total oxides of nitrogen

NH_3 - ammonia

TRS - total reduced sulphur

H_2S - hydrogen sulphide

PAH - polycyclic aromatic hydrocarbons

TSP - total suspended particulates

PM_{10} - inhalable particulates

$PM_{2.5}$ - respirable particulates

Table 13. *Weather conditions and Operator's Observations* in the Gregoire Lake Area. (May 15 to 19, 2000)

Monitoring Location	Date	Time (M.S.T.)	Temp. (oC)	RH (%)	WSP (km/h)	WDR	Cloud	Operator's Observations
Site # 1	15-May-00	2:18 p.m. to 3:26 p.m.	10	53	15	W	90%	No notable observations reported.
Site # 2		3:32 p.m. to 4:42 p.m.	9	49	17	N-NW	90%	6 km. N of Mariana Lake at Janvier Wood Products. 100m W of the hwy. Wood odours from yard & smoke from teepee burner. Plume overhead once in awhile. All larger particulates are from burner. Teepee burner is 300m E of MAML.
Site # 3		5:24 p.m. to 6:33 p.m.	9	51	4	W-NW	no data	63 km N of Janvier Wood Products on Hwy 63. 25m E of hwy at park entrance.
Site # 4	16-May-00	8:46 a.m. to 9:48 a.m.	7	55	4	V	100%	Ranger station at Gregoire Lake Provincial Park.
Site # 5		9:54 a.m. to 10:57 a.m.	6	54	6	E	100%	Gregoire Lake Estates ~5-7 km from the Provincial Park ~200m from lake.
Site # 6		11:03 a.m. to 12:08 p.m.	7	49	5	N	100%	Gregoire L.Water Treatment Plant ~4 km from previous site. 20m from lake.
Site # 7		12:16 p.m. to 1:18 p.m.	8	47	8	NW	100%	Checham Village campground ~5.3 km from previous site on hwy 868. 80m N of hwy & 50m S of Gregoire Lake.
Site # 8		1:23 p.m. to 2:34 p.m.	9	38	9	W-SW	100%	Anzac store 3 km from previous site. 50m N of hwy 868.
Site # 9		2:42 p.m. to 3:46 p.m.	8	40	6	W	100%	Amoco Glisp site ~4.2 km from previous site. Oil facility was here but was removed. Land here is Bitumen contaminated. Suncor plans to move soil to their landfill this summer.
Site #10		5:07 p.m. to 6:11 p.m.	7	42	5	V	100%	100m S of tanks & 65m W of well head shack. Winds variable. Some odours.
Site #11		7:37 p.m. to 8:40 p.m.	3	64	1	N	90%	Maqua Lake 17 km. W of hwy 868 from Anzac.
Site #12	17-May-00	12:11 p.m. to 1:11 p.m.	6	80	10	SE	100%	Conklin corner work camp. Because of the distance, this is a 2 hr sample.
		1:12 p.m. to 2:14 p.m.		79	8			
Site #13		2:55 p.m. to 3:55 p.m.	10	52	12	SE	100%	At Janvier Water Treatment Plant. Picking up road dust from local traffic.This is a 2 hour sample.
		3:56 p.m. to 4:56 p.m.	9	57	13	S		
Site #10		6:12 p.m. to 7:18 p.m.	8	63	10	S	no data	N of Gulf Surmont. Sitting just off site this time. Flare stack 320m from MAML & steam generator exhaust stack 208m from MAML. Pick up intermittant heavy oil odours.
Site #11	18-May-00	9:24 a.m. to 10:29 a.m.	11	65	4	SW	100%	Rained overnight. No rain during 1 hr average.
Site # 9		11:04 a.m. to 12:06 p.m.	14	55	6	S	100%	Light intermittant rain. There's a Pan-Canadian monitoring trailer in Anzac due to the proposed new plant going in 4km E of the Glisp site.
Site # 8		12:13 p.m. to 1:17 p.m.	16	48	6	V	90%	Light intermittant rain. Anzac corner store.
Site # 7		1:21 p.m. to 2:26 p.m.	16	51	4	N	90%	Checham Village campground. Light rain.
Site # 6		2:35 p.m. to 3:38 p.m.	16	60	5	SW	100%	Gregoire Lake Water Treatment Plant. Rain stops and starts.
Site # 5		3:45 p.m. to 4:46 p.m.	15	62	5	S	100%	Heavy rain, lightning. Bobcat operating 50m N of MAML.
Site # 4	19-May-00	9:12 a.m. to 10:14 a.m.	20	40	4	V	Sunny	Gregoire Lake Park station. Some minor traffic in and out of compound.
Site # 3		10:32 a.m. to 11:33 a.m.	19	33	5	W	50%	No rain. Some traffic exhaust.
Site # 2		12:13 p.m. to 1:15 p.m.	19	21	20	SW	no data	Pick up odours but can't get exactly downwind of plume unless wind changes direction. Teepee burner is 300m W and Hwy 63 is 140m W of MAML.
Site # 1		1:21 p.m. to 2:23 p.m.	20	21	14	W-SW	20%	No rain. Mariana Lake gas station.

Table 14. *Weather conditions and Operator's Observations* in the Gregoire Lake Area. (June 26 to 30, 2000)

Monitoring Location	Date	Time (M.S.T.)	Temp. (oC)	RH (%)	WSP (km/h)	WDR	Cloud	Operator's Observations
Site # 1	26-Jun-00	1:18 p.m. to 2:23 p.m.	20	38	8	N	70%	No rain.
Site # 2		2:28 p.m. to 3:30 p.m.	20	36	9	N	50%	300m E of teepee burner and 100m W of Hwy 63. No visible signs of smoke from burner. Slight odours (typical lumber).
Site # 3		4:08 p.m. to 5:08 p.m.	21	33	7	N	50%	This is a 2 hour sample. No rain.
		5:09 p.m. to 6:11 p.m.	21	33	6	NE		
Site # 4	27-Jun-00	8:35 a.m. to 9:37 a.m.	27	24	3	N-NE	0%	No notable observations reported by the MAML operator.
Site # 5		9:42 a.m. to 10:43 a.m.	28	24	4	NE	0%	
Site #11		11:31 a.m. to 12:37 p.m.	24	27	8	N-NE	0%	
Site # 6		1:14 p.m. to 2:15 p.m.	28	24	5	NE	40%	No rain.
Site # 7		2:24 p.m. to 3:33 p.m.	27	31	3	W	50%	
Site #14		3:46 p.m. to 4:47 p.m.	26	29	3	N	50%	Closed gate is 4.2 km from hwy. Site is another 1-2 km past gate.
Site # 8		5:06 p.m. to 6:08 p.m.	28	23	5	W	50%	No rain.
Site #12	28-Jun-00	9:59 a.m. to 10:59 a.m.	25	28	10	SW	20%	This is a 2 hour sample. Sitting 100m E of sec hwy 881.
		11:00 a.m. to 12:00 p.m.	24	32	8	W		
Site #13		12:58 p.m. to 1:59 p.m.	29	28	7	SE	30%	This is a 2 hour sample. No rain.
		2:00 p.m. to 2:59 p.m.	29	27	9	S		
Site #10		4:37 p.m. to 5:37 p.m.	26	30	10	S	no data	Pick up RHC. 202m from nearest steam gen exh stack. 5:19 PM-1 stack operating. 5:35 PM-second stack operating.
		5:38 p.m. to 6:38 p.m.	24	39	4	W		
Site # 4	29-Jun-00	8:35 a.m. to 9:38 a.m.	30	30	3	N	Sunny	RHC analyzer problem. No data for hydrocarbons.
Site # 5		9:44 a.m. to 10:45 a.m.	26	41	4	N	5%	No notable observations reported by the MAML operator.
Site #11		11:38 a.m. to 12:38 p.m.	26	31	12	W	20%	
Site # 6		1:10 p.m. to 2:17 p.m.	28	43	6	N	no data	Fire started - lightning ~1 km N of site. Instruments
Site #14		2:42 p.m. to 3:43 p.m.	30	33	3	N	no data	About 2 km N of Site #14. Gate is locked, no access.
Site # 7		3:55 p.m. to 4:57 p.m.	29	39	4	N	60%	Lightning and showers in surrounding areas.
Site # 8		5:02 p.m. to 6:04 p.m.	26	36	9	E	90%	Lightning and showers in the N towards Ft. Mac.
Site # 2	30-Jun-00	10:17 a.m. to 11:20 a.m.	13	112	11	N	100%	Light rain. 10:19 AM-Note: no smoke from teepee burner.
Site # 1		11:26 a.m. to 12:27 p.m.	13	103	8	V	100%	No rain.

Table 15. *Weather conditions and Operator's Observations* in the Gregoire Lake Area. (September 11 to 15, 2000)

Monitoring Location	Date	Time (M.S.T.)	Temp. (oC)	RH (%)	WSP (km/h)	WDR	Cloud	Operator's Observations
Site # 1	11-Sep-00	1:09 p.m. to 2:02 p.m.	15	36	10	SW	20%	No notable observations reported by the MAML operator.
Site # 2		2:07 p.m. to 3:13 p.m.	15	42	11	SW	50%	No activity from teepee burner. Typical lumber odours.
Site # 3		3:51 p.m. to 4:51 p.m.	15	38	7	SW	no data	This is a 2 hour sample. 4:57 PM-Traffic exhaust from hwy 63 not from MAML generator.
		4:52 p.m. to 5:55 p.m.	14	50	5			
Site # 4	12-Sep-00	7:24 a.m. to 8:26 a.m.	7	94	4	V	30%	No notable observations reported by the MAML operator.
Site # 5		8:32 a.m. to 9:42 a.m.	11	73	4	V	20%	8:50 AM - move 50m and face W.
Site #11		10:10 a.m. to 11:12 a.m.	12	67	11	W	70%	No notable observations reported by the MAML operator.
Site # 6		11:44 a.m. to 12:50 p.m.	15	58	8	SW	60%	No notable observations reported by the MAML operator.
Site #14		1:12 p.m. to 2:15 p.m.	19	46	5	SE	50%	Road dust-1:32 PM.
Site # 7		2:28 p.m. to 3:32 p.m.	17	53	15	W	60%	No notable observations reported by the MAML operator.
Site # 8		3:38 p.m. to 4:49 p.m.	17	45	21	NW	50%	No notable observations reported by the MAML operator.
Site #12	13-Sep-00	9:16 a.m. to 10:16 a.m.	14	57	10	N	5%	This is a 2 hour sample. Road dust is everywhere from vehicle activity.
		10:17 a.m. to 11:18 a.m.	16	45	10	NW	5%	
Site #13		12:39 p.m. to 1:39 p.m.	19	31	9	V	20%	This is a 2 hour sample.
		1:40 p.m. to 2:41 p.m.	19	32	11	W		
Site #10		4:01 p.m. to 5:01 p.m.	17	40	7	E	30%	2 hour sample. 4:12 PM - turn around. Variable wind 4:16 PM - turn around again. Road dust from vehicles.
		5:02 p.m. to 6:04 p.m.	14	57	3			
Site # 4	14-Sep-00	8:05 a.m. to 9:07 a.m.	14	64	3	N	100%	No rain.
Site # 8		9:23 a.m. to 10:25 a.m.	18	47	12	SE	30%	No notable observations reported by the MAML operator.
Site # 7		10:30 a.m. to 11:32 a.m.	20	45	4	SE	40%	Visit from RCMP.
Site #14		11:44 a.m. to 12:46 p.m.	22	39	11	S	40%	Lots of road dust during the hour from gravel trucks.
Site # 6		1:05 p.m. to 2:06 p.m.	25	34	12	SW	30%	Lots of dust due to high winds.
Site #11		2:32 p.m. to 3:32 p.m.	22	40	14	S	30%	This is a 2 hour sample.Visit from LFS person on the fire tower, remain at site 2 hrs.
		3:33 p.m. to 4:25 p.m.	21	45	13			
Site #5		4:51 p.m. to 5:54 p.m.	22	43	4	S	70%	4:55 PM - face W.
Site # 2	15-Sep-00	10:09 a.m. to 11:12 a.m.	18	50	12	W	20%	No teepee burner activity. Typical sawmill odour.
Site # 1		11:18 a.m. to 12:26 p.m.	19	43	13	W	10%	No notable observations reported by the MAML operator.

Table 16. *Weather conditions and Operator's Observations* in the Gregoire Lake Area. (December 4 to 8, 2000)

Monitoring Location	Date	Time (M.S.T.)	Temp. (oC)	RH (%)	WSP (km/h)	WDR	Cloud	Operator's Observations
Site # 1	4-Dec-00	1:21 p.m. to 2:22 p.m.	-15	84	12	S	100%	Light snow.
Site # 2		2:29 p.m. to 3:30 p.m.	-14	84	15	S	100%	Light snow. Teepee burner is not operating.
Site # 4	5-Dec-00	9:23 a.m. to 10:25 a.m.	-10	84	2	SW	100%	Light snow.
Site # 5		10:30 a.m. to 11:31a.m.	-10	85	3	W	100%	No notable observations reported by the MAML operator.
Site #11		12:00 p.m. to 1:01 p.m.	-11	89	4	W	100%	Light snow.
Site # 6		1:29 p.m. to 2:30 p.m.	-10	88	3	SE	100%	Light snow.
Site #14		2:54 p.m. to 3:55 p.m.	-10	87	2	NW	100%	Light snow.
Site # 7		4:16 p.m. to 5:17 p.m.	-11	90	4	E	100%	Light snow.
Site # 8		5:23 p.m. to 6:24 p.m.	-11	91	6	E	no data	Dark. Not snowing
Site #12	6-Dec-00	10:46 a.m. to 11:45 a.m.	4	86	14	W	100%	This is a 2 hour sample. Not snowing
		11:46 a.m. to 12:47p.m.	5	86	14	W		
Site #13		1:30 p.m. to 2:29 p.m.	5	76	6	N	100%	This is a 2 hour sample. Not snowing.
		2:30 p.m. to 3:31 p.m.	4	74	10	V		
Site #10		4:35 p.m. to 5:34 p.m.	-4	94	9	V	no data	This is a 2 hour sample. Dark. Not snowing. Freezing rain.Trace SO_2 during sample period.
		5:35 p.m. to 6:36 p.m.	-6	96	10	V		
Site # 4	7-Dec-00	9:11 a.m. to 10:12 a.m.	-14	80	2	W	100%	Light snow.
Site #11		10:48 a.m. to 11:49a.m.	-16	90	11	NW	100%	Not snowing
Site # 7		12:18 p.m. to 1:19 p.m.	-13	86	14	NW	no data	No notable observations reported by the MAML operator.
Site # 8		1:23 p.m. to 2:24 p.m.	-14	83	9	NW	100%	Light snow.
Site #14		2:34 p.m. to 3:35 p.m.	-13	82	3	V	100%	Not snowing
Site # 6		3:44 p.m. to 4:45 p.m.	-14	84	2	NW	100%	Not snowing.
Site # 5		5:07 p.m. to 6:08 p.m.	-14	85	2	W	no data	Exhaust influence from snowmobiles.
Site # 3	8-Dec-00	10:20 a.m. to 11:19 a.m.	-22	73	2	V	95%	This is a 2 hour sample. Not snowing. Trace SO2. Highway traffic exhaust.
		11:20 a.m. to 12:21p.m.	-22	70	2	SE		
Site # 2		1:04 p.m. to 2:05 p.m.	-20	73	12	NW	60%	Trace SO_2
Site # 1		2:10 p.m. to 3:11 p.m.	-20	77	11	NW	50%	No notable observations reported by the MAML operator.

Table 17. Median one-hour concentrations for selected air quality parameters in Alberta*.

Air Quality Station	Station or Survey Type	Monitoring Period	NH_3	CO	CH_4	RHC	THC	H_2S	NO_2	O_3	PM_{10}	$PM_{2.5}$	TSP	PAHs	SO_2	TRS
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	ng/m^3	ppm	ppm
Gregoire Lake[1]	mobile survey	May 2000 to Dec. 2000	BD	0.1	1.9	BD	2.0	BD	0.002	0.031	7	1	12	BD	0.000	BD
Fort Saskatchewan/Redwater[1]	mobile survey	May 2001 to Mar. 2002	0.001	0.3	2.1	0.1	2.1	BD	0.004	0.029	22	3	39	BD	0.001	BD
Cold Lake/Bonnyville/Elk Point[1]	mobile survey	Mar. 2001 to Feb. 2002	BD	0.2	1.9	0.1	2.1	BD	0.003	0.031	10	2	16	BD	BD	0.001
Whitecourt/Swan Hills/Shiningbank Lake[1]	mobile survey	Mar. 2001 to June 2001	0.001	0.2	2.0	0.3	2.3	BD	0.005	0.027	29	4	47	BD	0.004	0.001
Bow Corridor[1]	mobile survey	Dec. 1999 to Sep. 2000	0.001	0.2	1.8	0.1	1.9	BD	0.007	0.030	40	4	74	4	0.001	0.001
County of Grande Prairie[1]	mobile survey	Dec. 1998 to Oct. 1999	0.001	0.2	1.7	0.2	2.0	BD	0.002	0.036	9	2	14	BD	0.001	BD
Caroline/Sundre area[1]	mobile survey	Apr. 1997 to Apr. 1998	n/a	0.3	1.8	0.2	2.1	BD	0.009	0.042	3	BD	4	n/a	0.002	BD
City of Lethbridge[1]	mobile survey	Sep. 1998 to Jul. 1999	0.005	0.2	1.6	0.2	1.9	BD	0.003	0.046	11	2	17	BD	BD	BD
City of Medicine Hat[1]	mobile survey	May 1998 to Jan. 1999	0.003	0.4	1.8	0.2	2.1	BD	0.009	0.031	11	2	16	5	0.001	BD
Lethbridge area (Picture Butte, Sterling)[1]	mobile survey	Sep. 1998 to Jul. 1999	0.075	0.2	1.8	0.2	2.1	0.001	0.002	0.044	24	3	42	BD	0.001	0.002
Permanent Continuous Monitoring Stations																
Beaverlodge[2]	rural	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.002	0.027	n/a	n/a	n/a	n/a	BD	n/a
Calgary Central[2]	urban	Jan. to Dec. 2001	n/a	0.5	n/a	n/a	2.0	n/a	0.025	0.014	19	8	n/a	n/a	n/a	n/a
Calgary East[2]	urban	Jan. to Dec. 2001	n/a	0.5	n/a	n/a	2.1	0.001	0.022	0.015	n/a	n/a	n/a	n/a	0.002	n/a
Calgary Northwest[2]	urban	Jan. to Dec. 2001	n/a	0.3	n/a	n/a	2.0	n/a	0.013	0.024	n/a	n/a	n/a	n/a	n/a	n/a
Edmonton Central[2]	urban	Jan. to Dec. 2001	n/a	0.5	n/a	n/a	2.0	n/a	0.023	0.014	n/a	7	n/a	n/a	n/a	n/a
Edmonton East[2]	urban	Jan. to Dec. 2001	n/a	0.3	n/a	n/a	2.2	BD	0.015	0.021	n/a	8	n/a	n/a	0.002	n/a
Edmonton Northwest[2]	urban	Jan. to Dec. 2001	n/a	0.5	n/a	n/a	2.2	n/a	0.020	0.016	19	10	n/a	n/a	n/a	n/a
Fort Saskatchewan[2]	small urban	Jan. to Dec. 2001	0.002	0.3	n/a	n/a	1.9	BD	0.009	0.021	n/a	n/a	n/a	n/a	0.001	n/a
Red Deer[2]	small urban	Jan. to Dec. 2001	n/a	0.3	n/a	n/a	2.1	BD	0.010	0.019	n/a	7	n/a	n/a	BD	n/a
Buffalo Viewpoint[3]	industrial	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	1.9	BD	n/a	n/a	n/a	n/a	n/a	n/a	BD	n/a
Fort Chipewyan[3]	rural	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	n/a	n/a	BD	0.029	n/a	4	n/a	n/a	BD	n/a
Fort McKay[3]	rural	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	1.8	n/a	0.003	0.020	n/a	5	n/a	n/a	BD	BD
Fort McMurray (Athabasca Valley)[3]	small urban	Jan. to Dec. 2001	n/a	0.2	n/a	n/a	1.9	n/a	0.007	0.016	n/a	5	n/a	n/a	BD	BD
Fort McMurray (Patricia McInnes)[3]	small urban	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	1.9	n/a	0.003	0.021	n/a	6	n/a	n/a	BD	BD
Mannix[3]	industrial	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	1.8	BD	n/a	n/a	n/a	n/a	n/a	n/a	0.001	n/a
Mildred Lake[3]	industrial	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	2.0	BD	n/a	n/a	n/a	n/a	n/a	n/a	0.001	n/a
Carrot Creek[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.004	0.034	n/a	n/a	n/a	n/a	0.001	n/a
Hightower Ridge[4]	background	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	BD	0.048	5	BD	n/a	n/a	BD	n/a
Steeper[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.001	0.043	7	n/a	n/a	n/a	BD	n/a
Tomahawk[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.003	0.034	11	2	n/a	n/a	0.001	n/a
Violet Grove[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	1.8	n/a	0.002	0.037	n/a	n/a	n/a	n/a	0.001	n/a
Sherwood Park[5]	small urban	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	2.2	BD	n/a	n/a	n/a	n/a	n/a	n/a	0.002	n/a
Caroline[6]	rural	Aug. to Dec. 2001	n/a	n/a	1.9	n/a	2.0	BD	0.002	0.035	n/a	n/a	n/a	n/a	0.001	BD

1 Mobile survey conducted by Alberta Environment.
2 Station operated by Alberta Environment.
3 Station operated by the Wood Buffalo Environmental Association
4 Station operated by the West Central Airshed Society (data from Oct to Dec 2001 not available).
5 Station operated by the Strathcona Industrial Association.
6 Station operated by the Parkland Airshed Management Association.

n/a Parameter not monitored or data not available.
BD - indicates below the detection limit of the instrument
* Data is from the Alberta Ambient Air Data Management System (http://www.casadata.org).

Table 18. Maximum one-hour concentrations for selected air quality parameters in Alberta*.

Air Quality Station	Station or Survey Type	Monitoring Period	NH_3	CO	CH_4	RHC	THC	H_2S	NO_2	O_3	PM_{10}	$PM_{2.5}$	TSP	PAHs	SO_2	TRS
			ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	µg/m³	µg/m³	µg/m³	ng/m³	ppm	ppm
Gregoire Lake[1]	mobile survey	May 2000 to Dec. 2000	0.007	0.5	4.6	1.8	5.0	0.002	0.011	0.059	915	60	1764	16	0.011	0.004
Fort Saskatchewan/Redwater[1]	mobile survey	May 2001 to Mar. 2002	0.557	2.2	3.6	0.5	3.6	0.003	0.051	0.049	323	24	547	70	0.022	0.004
Cold Lake/Bonnyville/Elk Point[1]	mobile survey	Mar. 2001 to Feb. 2002	0.005	1.4	4.6	7.1	9.7	0.054	0.014	0.047	1188	72	2281	14	0.017	0.056
Whitecourt/Swan Hills/Shiningbank Lake[1]	mobile survey	Nov. 2000 to June 2001	0.013	0.7	2.5	2.5	4.3	0.003	0.030	0.054	441	43	946	113	0.046	0.005
Bow Corridor[1]	mobile survey	Dec. 1999 to Sep. 2000	0.034	1.1	2.2	6.6	7.8	0.002	0.031	0.056	1094	60	2082	36	0.092	0.004
County of Grande Prairie[1]	mobile survey	Dec. 1998 to Oct. 1999	0.030	1.0	6.4	29.4	32.4	0.009	0.061	0.064	1287	101	2305	35	0.043	0.010
Caroline/Sundre area[1]	mobile survey	Apr. 1997 to Apr. 1998	n/a	0.9	2.6	0.7	2.9	0.008	0.040	0.059	43	17	52	n/a	0.043	0.008
City of Lethbridge[1]	mobile survey	Sep. 1998 to Jul. 1999	0.020	2.4	1.9	0.4	2.2	0.003	0.016	0.062	363	294	405	21	0.007	0.001
City of Medicine Hat[1]	mobile survey	May 1998 to Jan. 1999	0.027	2.8	2.3	0.4	2.6	0.004	0.080	0.062	135	12	213	35	0.029	0.001
Lethbridge area (Picture Butte, Sterling)[1]	mobile survey	Sep. 1998 to Jul. 1999	1.364	1.2	7.1	1.6	9.5	0.054	0.013	0.059	298	32	490	11	0.004	0.054
Permanent Continuous Monitoring Stations																
Beaverlodge[2]	rural	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.028	0.068	n/a	n/a	n/a	n/a	0.030	n/a
Calgary Central[2]	urban	Jan. to Dec. 2001	n/a	9.7	n/a	n/a	4.1	n/a	0.150	0.061	262	60	n/a	n/a	n/a	n/a
Calgary East[2]	urban	Jan. to Dec. 2001	n/a	10.1	n/a	n/a	5.1	0.038	0.092	0.068	n/a	n/a	n/a	n/a	0.036	n/a
Calgary Northwest[2]	urban	Jan. to Dec. 2001	n/a	6.3	n/a	n/a	3.5	n/a	0.065	0.073	n/a	n/a	n/a	n/a	n/a	n/a
Edmonton Central[2]	urban	Jan. to Dec. 2001	n/a	5.4	n/a	n/a	4.8	n/a	0.086	0.062	n/a	275	n/a	n/a	n/a	n/a
Edmonton East[2]	urban	Jan. to Dec. 2001	n/a	2.8	n/a	n/a	25.0	0.022	0.084	0.083	n/a	276	n/a	n/a	0.061	n/a
Edmonton Northwest[2]	urban	Jan. to Dec. 2001	n/a	11.2	n/a	n/a	6.5	n/a	0.104	0.071	391	261	n/a	n/a	n/a	n/a
Fort Saskatchewan[2]	small urban	Jan. to Dec. 2001	0.041	5.1	n/a	n/a	5.5	0.005	0.077	0.080	n/a	83	n/a	n/a	0.022	n/a
Red Deer[2]	small urban	Jan. to Dec. 2001	n/a	5.0	n/a	n/a	6.4	0.009	0.051	0.073	n/a	162	n/a	n/a	0.011	n/a
Buffalo Viewpoint[3]	industrial	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	11.8	0.012	n/a	n/a	n/a	n/a	n/a	n/a	0.231	n/a
Fort Chipewyan[3]	rural	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.024	0.055	n/a	58	n/a	n/a	0.025	n/a
Fort McKay[3]	rural	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	4.2	n/a	0.042	0.058	n/a	86	n/a	n/a	0.158	0.018
Fort McMurray (Athabasca Valley)[3]	small urban	Jan. to Dec. 2001	n/a	5.8	n/a	n/a	5.8	n/a	0.062	0.062	n/a	267	n/a	n/a	0.071	0.003
Fort McMurray (Patricia McInnes)[3]	small urban	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	6.3	n/a	0.073	0.074	n/a	101	n/a	n/a	0.042	0.011
Mannix[3]	industrial	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	6.6	0.027	n/a	n/a	n/a	n/a	n/a	n/a	0.211	n/a
Mildred Lake[3]	industrial	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	6.9	0.022	n/a	n/a	n/a	n/a	n/a	n/a	0.136	n/a
Carrot Creek[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.059	0.077	n/a	n/a	n/a	n/a	0.019	n/a
Hightower Ridge[4]	background	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.015	0.081	31	36	n/a	n/a	0.018	n/a
Steeper[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.019	0.075	193	n/a	n/a	n/a	0.006	n/a
Tomahawk[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	n/a	n/a	0.039	0.080	187	56	n/a	n/a	0.029	n/a
Violet Grove[4]	rural	Jan. to Sept. 2001	n/a	n/a	n/a	n/a	8.4	n/a	0.036	0.070	n/a	n/a	n/a	n/a	0.015	n/a
Sherwood Park[5]	small urban	Jan. to Dec. 2001	n/a	n/a	n/a	n/a	8.8	0.012	n/a	n/a	n/a	n/a	n/a	n/a	0.043	n/a
Caroline[6]	rural	Jan. to Dec. 2001	n/a	n/a	3.5	n/a	7.2	0.017	0.031	0.074	n/a	n/a	n/a	n/a	0.017	0.017

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